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Teaching Spelling to Third and Fourth Grade Pupils with the Use of Programmed Materials and Teaching Machines.

Sioux Falls Public Schools, S. Dak.

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To determine the effectiveness of programed materials and teaching machines in teaching spelling to third and fourth graders, a research project was designed covering an entire year and using classes in three schools as subjects. Classes at the experimental school used TMI-Grolier's "Modern English Series: Spelling" and the Min/Max II teaching machine as their spelling instruction for the year. Classes at one control school studied the word list for the programed course by conventionalmethods. Classes at the other control school followed the traditional, conventional course for the year. A descriptive analysis of the program was made from teacher and student evaluations. An analysis of variance was made for each of two possible variables considered, intelligence scores and spelling achievement, and for each of the five criteria instruments used in the study. Tests of statistical significance were made for total groups, by grade level, and by ability level to test the gain made by each group. It was concluded that there was no evidence to support one form of instruction over the other, that classes using teaching machines spent too much time with mechanical difficulties, that low ability groups benefited most from programed methods, and that the use of programed materials in textbook rather than teaching machine format should be investigated for elementary school use. (MT)

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TEACHING SPELLING TO THIRD AND FOURTH
GRADE PUPILS WITH THE USE OF
PROGRAMMED MATERIALS AND

SIOUX FALLS PUBLIC SCHOOLS

E. W. Skarda, Superintendent

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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TEACHING SPELLING TO THIRD AND FOURTH GRADE PUPILS WITH THE USE OF PROGRAMMED MATERIALS AND TEACHING MACHINES

May, 1963

Dr. Robert W. O'Hare

Administrative Assistant to Superintendent

EM 006 919

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CHAPTER I

INTRODUCTION

In the spring of 1962, a study was designed to compare methods of teaching spelling to third and fourth grade pupils during the 1962-1963 school year. One of the methods considered and used consisted of the use of programmed materials and teaching machines.

Because of the increased use of educational innovations throughout the country and because of many successful experiences resulting from their use, the local board of education and school administration have initiated a research program in the local school system so that such innovations can be tested for local use. After several discussions among the administrative staff members and faculty, it was suggested that a research program be designed through which the use of programmed materials and teaching machines could be appraised. It was decided that one phase of this program would consist of the use of programmed materials and teaching machines in the teaching of spelling to third and fourth grade pupils.

I. NEED FOR THE STUDY

Local school authorities wished to test the use of programmed materials and teaching machines in the teaching of spelling to third and fourth grade pupils. A limited number of similar studies conducted in various schools throughout the nation are available.

However, it was felt that the number of such studies was not sufficient. Also, it was felt that a local study should be made to determine which results would apply to the local system. Programmed materials and teaching machines are relatively expensive and it is necessary to determine their usefulness, feasibility, and effectiveness before they are purchased in large quantities.

II. STATEMENT OF THE PROBLEM

This study is designed to compare two methods of teaching spelling: by the conventional method and with the use of programmed materials and teaching machines. It is also designed to provide descriptive analyses of the use of programmed materials and teaching machines. More specifically, the objectives of the study were:

1. To compare standardized spelling test results between control and experimental groups.
2. To compare the control and experimental groups on the results of tests based on a word list selected from the words in the programmed materials.
3. To compare the control and experimental groups on the results of tests used to measure transfer of spelling skills.
4. To compare the control and experimental groups on the results of tests of rules of spelling.

5. To compare attitude-toward-school inventory results between control and experimental groups.
6. To present descriptive analyses of the use of programmed materials and teaching machines.
7. To compare time needed to complete the program.

III. PROCEDURE FOR THE STUDY

The study was designed to include the following procedures:

Sample

Three elementary schools (two for control and one for experimental) were chosen at random. In the two control schools the two sections each of third and fourth grade students constitute the entire third and fourth grade population in these schools. In the experimental school two sections each of third and fourth grade students were selected on the basis of the most experienced teachers.

Classroom

The experimental group consisted of two sections each of third and fourth grade pupils. Their classroom experiences in spelling were to consist of using a programmed spelling course with a teaching machine for 20 minutes per day.

There were two control groups, Control Group A and Control Group B, each consisting of two sections each of third and fourth grade pupils. The two control groups and one experimental group each came from different elementary schools. Control Group A was to devote 20 minutes per day to spelling, with the word list from the programmed spelling course being used as the basis for instruction. However, students in Control Group A were taught the spelling word list without the use of programmed materials or teaching machines. They were instructed by conventional methods.

Control Group B was to devote 20 minutes per day to spelling, using the conventional spelling program for the appropriate grade level. They did not use programmed materials, teaching machines, nor the word list based on the programmed spelling course.

Each individual in the experimental group continued to use the programmed course and teaching machine until he had completed the course. Each group maintained detailed records of time.

Testing

All three groups were administered the following tests at the beginning of the experiment: intelligence, two standardized spelling tests, a spelling test based on selected words from the program, a spelling test based on selected words to measure transfer of spelling skills, a test on rules of spelling, and an attitude-toward-school inventory. The intelligence test and one spelling achievement test were used only once. However, the other five instruments were used in a pre- and post-testing situation, that is, at the beginning of the experiment and at the end of the experiment. Students using the teaching machines were tested individually as they finished the program. Those not finishing the program were tested toward the end of the school year, the week of May 13. Students in both control groups were tested when Control Group A completed the word list, the week of April 15.

Each of the four teachers in the experimental group maintained a descriptive anecdotal record. An attempt was made to record routine as well as unusual happenings. Evaluation sheets were completed by each teacher in the experimental group at the end of the school year. Each student in the experimental group maintained time records and also reported reactions and attitude on an evaluation sheet at the end of the year.

A reliability coefficient of 0.80 has been obtained on a test consisting of 40 words selected from the programmed course. The Kuder-Richardson formula was used to obtain this coefficient with a group of students in the Sioux Falls Public Schools (see Appendix A).

Following is a list of the evaluation instruments used in this research project:

1. Pre and Post Tests
    - A. National Achievement Tests in Spelling (Acorn Publishing Company)
    - B. Test on Word List from Programmed Spelling Course (40 selected words)
    - C. Test on Word List to Measure Transfer of Spelling Skills (Designed by local curriculum department)
    - D. Test on Rules of Spelling (from Programmed Materials course)
    - E. How I Like School (Attitude-Toward-School Inventory, University of Minnesota)
2. Pre Tests Only
    - A. Large Thorndike Intelligence Test (appropriate form of test for each grade level

3. Others

  A. Teachers' Anecdotal Records

  B. Teachers' Evaluation Sheets

  C. Students' Time Logs and Commentary

  D. Students' Evaluation Sheets

(See Appendices B through K.)

Descriptive Analyses

These analyses consist of a descriptive account of the experiment, describing procedures, and reporting routine as well as unusual happenings. An attempt is made to report the reactions, feelings, and attitudes of teachers and students to programmed materials and teaching machines. What type of student did the machine seem to motivate? Which type did it fail to motivate? What significant changes in student behavior might be due to the experiment? Anecdotal records and evaluation sheets of students and teachers support this phase of the investigation. Also, time records maintained by the students are analyzed in this phase of the report.

Statistical Analyses

Intelligence tests and the spelling subtest of the Iowa Tests of Basic Skills were administered to all three groups to determine whether these variables needed to be controlled statistically. Tests of statistical significance were made on the pre- and post-testing on the four spelling tests and attitude-toward-school inventory. Further tests of statistical significance were made, based on three levels of ability as determined by the intelligence tests.

IV. ORGANIZATION OF THE REMAINDER OF THE STUDY

The remainder of this report will contain a review of the related literature on the teaching of spelling through the use of programmed materials and teaching machines, a descriptive report of the methods and procedures used in the three groups, an analysis of teachers' anecdotal records and evaluations, an analysis of students' reports and evaluations, statistical analysis of data, and conclusion.

CHAPTER II

REVIEW OF RELATED LITERATURE

The field of programmed instruction and teaching machines or auto-instructional devices is a developing field still in its infancy. Changes are occurring almost daily. It is very difficult, for example, to maintain current information relative to new programs and new types of machines available. The number of research studies in this area is increasing rapidly also.

An NEA Journal contained a glossary relative to programmed instruction. It defined:

GLOSSARY

> Auto-instruction (self-instruction). A comprehensive term denoting an instructional process that usually involves carefully planned materials and devices designed to produce learning without necessarily requiring additional human instructional assistance.
>
> Program. Subject matter arranged in a carefully planned series of sequential items and involving (a) controlled presentation of material, (b) active response of learner, (c) use of cues (prompts) to elicit correct responses, (d) immediate confirmation of success or failure (feedback), and (e) reinforcement of correct responses in such a way as to enable individual learners to move ahead, independently and at their own pace, from familiar background to new and previously determined terminal behavior. Programs may be presented in books, in loose-leaf binders, in special machines, and in other ways.
>
> Teaching machine (auto-instructional device). A mechanical device by which a program is displayed to a learner. It usually presents one frame (item) at a time, provides some method for the student to indicate an overt response, shows whether response is correct or not,

> prevents cheating by student, maintains a record of student responses; enables use of nonverbal programs, that is, programs which are either totally or in part presented in audio and/or visual form.[1]

A special brochure prepared by the National Education Association contained the following pertinent information:

> WHAT IS A TEACHING MACHINE?
>
> Various types of instructional equipment which the individual student uses at his own rate of learning are popularly known as teaching machines, although authorities in the field prefer the term auto-instructional devices.
>
> They may be simple or complicated, toy-like or computer-like, inexpensive or costly, but all teaching machines have certain characteristics that distinguish them from more traditional audiovisual equipment.
>
> ..They are designed for the individual student (one machine and one student) rather than for mass instruction of an entire class at one time.
>
> ..The machines require active response from the student who must manipulate them in some manner to indicate his responses to questions or problems they present.
>
> ..Teaching machines tell the student immediately whether his answer is right or wrong, providing reinforcement, an extremely important aspect of the learning process.
>
> ..Teaching machines present a certain organized program of material that may be tackled by the student at his own rate of learning.
>
> Most teaching machines are cheatproof and do not allow the student to see the correct answer to a question or problem until he has recorded his own. Some give only the correct answer; others explain why a student's answer was right or wrong. Most will not allow the student to proceed to complex problems until he has correctly solved the simpler ones.

---

[1] National Education Association, Teaching Machines and Programed Learning, A Glossary Prepared by the Staff of the NEA Journal (Washington: National Education Association, 1961), p. 15.

> WHAT ARE PROGRAMMED TEXTBOOKS?
>
> Closely related to teaching machines are programed textbooks which look like any textbook externally, but which are quite different in make-up. The programed text presents in proper sequence the separate steps, or questions, that make up the program. Answers to these questions appear in the book on subsequent pages.
>
> Although the programmed text has much in common with the machine, it neither prevents the student from looking at the answer prior to answering the question nor controls other aspects of student behavior --aspects which can be prevented by machines or which machines can take into account. According to some studies this type of "cheating" appears to have little effect on learning, especially at the more advanced educational levels.
>
> ARE TEACHING MACHINES SOMETHING NEW?
>
> Not exactly. Although they have been in general use in public elementary and secondary schools for only four or five years, teaching machines have been used in colleges much longer, and the armed forces have been doing much technical training by machine for at least 20 years. The first teaching machines, as we know them, were developed more than 40 years ago and have been used in limited numbers and for experimental purposes ever since.
>
> WHY HAS THEIR DEVELOPMENT LAGGED?
>
> Fear, cost, and lack of adequate programs are the main reasons that teaching machines did not come into popular use sooner. A few teachers have feared for their jobs, and some parents have feared that their children would not be treated as individuals where teaching machines were used. Costs of machines and programs have been greater than many districts have wanted to pay, especially when they suspected that, by waiting, more advanced materials might be put on the market at lower prices. Most important has been the shortage of programs for general use in the schools. However, much work has now been done on programming instructional material for most elementary- and secondary-school subjects, and these programs are now ready for wide experimental use in the schools.
>
> IS IT TRUE THAT TEACHING MACHINES MAY REPLACE THE TEACHER?
>
> No, definitely not! At the turn of the century, Thomas Edison predicted his motion-picture projector would do away with the need for teachers. Earlier, similar sentiments were expressed about the printed book. But like automatic washing machines and housewives, teaching machines and teachers have different purposes.

Machines can instruct and tutor and thereby help a teacher give students information and drill on an individual basis. The teacher is thus freed from much routine work and has more time to help students learn, individually and collectively. Though his role may change somewhat as more and more technological devices find acceptance in the classroom, the teacher remains the central figure in the instructional program.

WILL TEACHING MACHINES REPLACE TEXTBOOKS?

They will not replace textbooks, but undoubtedly they will have a considerable effect upon them.

However, not all material can or should be programed. The good teacher will add the teaching machine to her storehouse of instructional devices. It will supplement, not replace, textbooks and the other time-tested audio-visual aids at the teacher's disposal.

WHO CAN LEARN WITH TEACHING MACHINES?

Nearly all students can benefit from teaching machines. Significant success has been recorded both with those who require considerable individual attention at a slow pace and those who need freedom to proceed as rapidly as possible. Makeup problems are reduced and varied needs and interests are met more adequately when teaching machines are used.

Teaching machine programs are constructed to provide motivation to the curriculum. They force habits on students by the way the material is presented and by the constant demand for immediate, active student response. These habits seem to carry over into traditional learning experiences to the benefit of all types of learners.

HOW DOES LEARNING BY MACHINE COMPARE WITH LEARNING BY STANDARD TEACHING?

Research indicates that some students are able to learn much more and much faster when teaching machines are used to supplement standard classroom procedures. There is still some fear that teaching machines may destroy creativity, but research has not found this to be true. What machines can do for a student over a long period of time remains to be seen. Much more research is needed in this very promising area of education.

WHAT SUBJECTS CAN MACHINES TEACH?

In theory, any subject that can be verbalized can be programed. To date, the largest number of programs have been developed in arithmetic, mathematics, and the sciences, although a programed course in creative writing (among other subjects) is now being developed. Military and industrial personnel are being taught technical and occupational skills as well as traditional school subjects via teaching machines.[1]

Hilgard[2] has stated that programmed instruction derives its support from established principles in the psychology of learning. He listed six principles which support this: programmed instruction recognizes individual differences by beginning where the learner is and permitting him to proceed at his own pace; programmed learning requires activity on the part of the learner; immediate knowledge of results are available; the organized nature of knowledge is emphasized because it requires continuity between the easier and harder concepts; in order to guarantee a high degree of success spaced review is provided; and finally, programmed instruction reduces anxiety because the learner is not threatened by the task.

Research projects have been conducted in the teaching of spelling with the use of programmed instruction and teaching machines. Lumsdaine quotes the following study in his book:

> In the academic year 1957-58 an experiment was carried out on the teaching of spelling to elementary school children under the sponsorship of the U. S. Office of Education. Porter used a simple write-in type of teaching machine. The materials were printed on eight-inch

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[1] National Education Association, Teaching Machines and Programed Instruction: An Introduction for Students and Their Parents. A Report Prepared by the Staff of the National Education Association.

[2] Ernest R. Hilgard, "What Support from the Psychology of Learning?" NEA Journal (Washington: National Education Association, 1961), Vol. 50, No. 8, pp. 20-21.

wide duplicating paper. On the first line of the sheet a question was printed which required the student to respond directly on the sheet through an open window in the machine. The student then moved a lever which rolled the paper up one line; this placed the question and the students' written answer under a sheet of glass, also exposing the correct answer so that he could score himself right or wrong. The lever was then moved to bring the next item into view. The chief functions of the machine were to expose one item at a time and to prevent cheating.

An interesting aspect of the entire program was that no spoken instruction was given to students. Teaching materials paralleled standard lessons in textbooks which were used by the control group as closely as possible. The words taught were exactly the same as those received by the control group.

The teaching-machine program attempted the following sequence of responses:

1. Identification of spelling words in a meaningful sense context.
2. Matching the correct word or given definition.
3. Matching several words on the basis of letter structure.
4. Writing missing letters in words presented in sentence context.

Twenty-two weeks of a normal 34-week program of spelling instruction were given on both the sixth- and the second-grade levels using the teaching machine. Results were measured on standardized achievement test scores. These showed the experimental group to be significantly superior.

Porter reported that there was essentially no relationship between intelligence scores and achievement in the experimental group, but there was a significant positive relationship in the control group. Porter's experiment seemed to indicate that this type of instruction is particularly good for the lower IQ groups. No relationships existed in either group with respect to sex or whether or not students liked the instructional method. To check on the "novelty" factor of the new instruction process, Porter compared first-half and second-half machine scores; no differences were apparent.

In the sixth-grade experimental group a positive relationship existed between the number of responses per lesson required as subjects and subsequent achievement, but no relationship existed between the number of errors per lesson and achievement. In the sixth-grade group, lesson materials were available on a week-by-week basis; yet the experimental group spent only about one-fourth as much time studying as did the control group.

> In the second-grade group, materials were available on an ad libitum basis for 12 weeks. During this time the spread of materials extended to nine lessons; in other words, some students had a high rate of response when released from the more strait-laced type of curriculum . . . . The experimental group gained 1.42 years while the control group gained .90 years. A sign test showed this to be significant at the .01 level. Statistical data for the second grade showed that the experimental group gained .80 years while the control group gained 1.10 years (U test, .005). A second method of rating second-graders was letter position scores in which each letter was scored. In this the experimental group gained 65.6 while the control group gained 37.8 (U test, .001). In an interesting sidelight Porter found that 20 per cent of the second-graders and 10 per cent of the sixth-graders could not match their answers with the answers given in the machine. -- E. B. Fry et al.[1]

Troemel[2] reported a research study involving the use of teaching machines in improving spelling of fourth grade pupils in Sioux Falls who had been classified as having difficulties in both reading and spelling. Using 75 fourth-grade pupils ranging in intelligence from 90 to 110, he compared the use of teaching machines with the conventional teacher method of teaching spelling to remedial reading students. On the three tests used, he found the teacher method superior to the machine method in each case ($p < .05$).

The results of Troemel's study differ from results obtained in many other investigations regarding a comparison of teacher method with machine method. However, the subjects used in Troemel's investigation were selected on the basis of having difficulty in both reading and spelling.

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[1] A. A. Lumsdaine and Robert Glaser, Teaching Machines and Programmed Learning (Washington, D. C.: National Education Association, 1960), pp. 673-674.

[2] Roland Troemel, "What Research Shows About Programmed Learning and Remedial Readers," SDEA Journal Vol. 38, No. 4, March, 1963.

Although many conflicts are reported in the results of research studies relative to teaching machines, most studies describe the superiority of the machine method over teacher method. When such comparisons are not made, the research study usually points out many advantages of teaching machines and programmed materials.

CHAPTER III

METHODS USED BY THREE GROUPS

Three schools were involved in this research project. Two sections of third grade students and two sections of fourth grade students participated from each of the three schools. One school, Cleveland, was designated as the experimental school and students in the project at this school received their instruction in spelling through the use of programmed materials and teaching machines. Two schools were designated as control schools. Control School A, Emerson, used the same list of words which was included in the programmed materials. However, neither programmed materials nor teaching machines were used. Instruction was based on what might be classified as conventional or traditional methods. Control School B, Lincoln, participated strictly as a control school, as the traditional spelling program for third and fourth grade pupils in the Sioux Falls Public Schools was used as the basis of instruction. The word list used in the spelling lessons was not the same as the word list in the programmed materials. No changes were made in the traditional program in Control School B.

The three schools were selected at random. The only factor which minimized the randomness was that it was desirable to select schools in Sioux Falls which were not already involved in major research projects;

especially at the third and fourth grade levels. The populations used appear to be stratified, however, as will be indicated in the chapter involving the analyses of statistical data.

I. THE TIME FACTOR

Some explanation needs to be made concerning the time element in this project. Control School B used traditional (conventional) methods and materials throughout the entire year. Classes in this school started their spelling at the beginning of the school term and continued throughout the entire school year. Their program was similar to the other 17 elementary schools in Sioux Falls which were not included in this project.

Due to the late arrival of programmed materials and teaching machines, the Experimental Group and Control Group A were not able to begin the project until October 22, 1962. The first day any instruction was given with the use of the programmed materials and teaching machines was October 22, 1962. Instruction in spelling using the word list from the programmed materials was delayed in Control Group A until October 22, also.

Students in Control Group A continued to receive their spelling instruction from the programmed word list until they had completed the list of words. Students in the class completed the list at the same time as they were receiving their instruction by conventional methods. The group completed their instruction in spelling from the programmed word list on April 12, 1963.

Students in the Experimental Group worked independently and, consequently, completed the program at various times. February 12, 1963 was the earliest date of completion for any student in the Experimental Group. The project was terminated on May 15, 1963 to allow time for the extensive post-testing. Sixty-five students in the Experimental Group had not completed the program by that date.

Some differences existed in the assignment of homework in spelling. The teachers at Emerson (Control Group A) were the only ones who consistently assigned homework in spelling. At the third grade level this averaged 15 to 20 minutes per day. In one fourth grade the time for homework averaged 5 to 10 minutes per day and in the other fourth grade in the project an assignment was made only when a low test score was exhibited.

At Lincoln school (Control Group B) no homework in spelling was assigned to the class. Students needing special help received individual assignments.

In the third grade at Cleveland (Experimental School) no assignment was made in spelling. Fourth grade pupils in the project received assignments on an individualized basis, as they needed extra help.

Therefore a difference in time in the assignment of spelling homework did exist. One can only speculate as to how much this affected the outcome.

II. THE EXPERIMENTAL GROUP

As stated earlier, the Experimental Group received their spelling instruction through the use of programmed materials and teaching machines. TMI - Grolier's Modern English Series: Spelling and the Min/Max II machines were used.

The publishers list the program as consisting of 3099 frames (620 pages) with an intended population of "3rd grade up." A third grade reading skill is required. The publishers estimate that 12 to 24 hours are needed to complete the course although they do not indicate the grade level considered. (If 20 minutes per day were devoted to spelling this would mean 36 to 72 class periods required for completion of course.)

The publishers included 440 words in the program (see Appendix L). Included are words that are likely to be in a student's everyday vocabulary, such as "television," even though they might not appear on a conventional word list, the authors state.

Students were required to go to a central storage for their materials as all four sections in the research project at Cleveland used the same programs and machines. An Answer-Mate was attached to each machine. The Answer-Mate contained a roll of adding machine tape on which the students wrote their answers. Therefore, the programs were not consumed but were reusable.

The two third grade sections used an average of 35 to 40 minutes per day for spelling instruction. This included time necessary to go to the central storage and return with their machines. This transfer of machines and materials consumed an estimated ten minutes per day. The two fourth grade sections used approximately 30 minutes per day for spelling instruction, including time for transfer of machines.

Each student in the four sections used the machines daily. Each student proceeded at his own rate and received help from the teacher when he requested it. Otherwise, each student worked independently.

Tests were constructed by the company for use at the beginning and end of the twelve units in the programmed spelling course. Students took these before attempting each unit and again at the completion of each unit.

Teachers in the experimental group decided that children should repeat the unit if they did not attain a certain score on the post test. Therefore, many of the students repeated several of the units, some more than once. Although the project was not conceived with this in mind, this approach was allowed. It did, however, appreciably increase the time necessary to complete the course.

Letters and an explanation of teaching machines and programmed learning (see Appendix M) were sent to parents of students in the experimental group. Parents were encouraged to seek further information from school officials if they desired it.

A meeting was held with the teachers and principal in the experimental group, the curriculum consultants, and the director of research for the system. At that time, information (see Appendix N) was released concerning the teachers' participation in the experiment.

Instruction sheets (see Appendix O) were distributed to students in the experimental group. These included instructions regarding the use of programmed materials and teaching machines.

III. CONTROL GROUP A

Students from the third and fourth grades at Emerson made up Control Group A. Students in this group received instruction by conventional methods. The spelling word list was the same list as used in the programmed materials. An average of 25 minutes per day was devoted to spelling instruction.

Although it has been stated that the students in Group A received instruction in spelling through conventional methods, this needs some explanation.

The traditional approach to the teaching of spelling in the local school system includes the use of prepared materials. These materials consist of published textbooks.

Therefore, it was impossible for teachers in Group A to follow the conventional or traditional approach. They had to start with a list of words without any other teaching aid. Materials had to be prepared so that the words could be presented in proper context and order.

Much help was received from the consultants in the curriculum department. Some of the materials prepared are presented in Appendix P.

Although this consulting was greatly appreciated by the teachers and was for the improvement of instruction in the school, it did contaminate the research project. Therefore, what is really present in this project is a comparison of the teaching machine method (Experimental Group) with the approach used by the teachers and consultants in Group A with the traditional approach used in Group B.

IV. CONTROL GROUP B

Students in Control Group B received instruction in spelling through the conventional methods and materials used by the 17 elementary schools in the local system which were not participating in the spelling research project. Teachers in this school received the same materials and help which all schools received. Some of this material is in Appendix Q. Approximately 25 minutes per day were devoted to classroom instruction in spelling.

CHAPTER IV

ANALYSIS OF TEACHERS' ANECDOTAL RECORDS AND EVALUATIONS

Teachers in the Experimental Group made two types of evaluations. They maintained a written log of events during the year and completed an evaluation form at the close of the year.

I. TEACHERS' WRITTEN LOG

Teachers in the Experimental Group were asked to maintain an anecdotal record during the year. An analysis of these written records indicates that the four teachers made several entries at the beginning of the project but after the first month of participation made an average of only one entry per month.

At the beginning of the experiment, entries made suggested a considerable amount of frustration:

> 10/19 First time with machines. The children were thrilled and excited with them. Things went well!
>
> 10/20 The teacher has no time to check on childrens' work. Every minute is spent being a mechanic.
>
> 10/22 First day of spelling with the machines. Extremely hectic. The papers will not go through the machine straight. The children have trouble keeping the pages in order.
>
> 10/23 This is our first day with the machines. Confusion! There are faulty machines. No one accomplished too much. Many were frustrated. Very little actual work was done.

> 10/23 Day of confusion. The boys and girls were excited about the machines. However, they did not work well at all. The machines jammed. I was so busy helping the students fix their machines I could not observe them working.
>
> 10/24 Today was still somewhat of a riot. Most of the time was spent teaching the children how to keep boxes in order.
>
> 10/24 Machines still causing trouble.
>
> 10/26 Things went smoothly today for the first time. It still takes a minimum of 45 minutes and of that about 15 or 20 minutes is devoted to actual work on the program.
>
> 10/30 Hectic day! One boy dropped a box and the first six units were all a mess. No time at all to check on youngsters' work.

It appeared that it took each of the classes several days to adjust to the programmed materials and teaching machines. Breakdowns on the machines were quite regular during the first few days. This was caused by two factors: the inexperience of the students and teachers in using these materials and faulty gears and rollers in the machine. The company replaced all of the faulty rollers and a great improvement was noticed immediately. Some of the entries made by teachers after the first few days read:

> 10/25 Things are beginning to clear up. The children seem to enjoy the work immensely.
>
> 10/26 Everyone is more sure of what's going on.
>
> 10/30 This week is going smoothly. Machines are now in working order.

All of the teachers expressed concern that the students were racing through the frames too rapidly and attempting to finish the program rather than trying to learn something. Concern was expressed relative to various groups of pupils also. Some comments which verify this are:

10/24 Some pupils seem to think this is a spelling race. Even the brighter students didn't study long enough to know the letter combinations for long vowel sounds.

10/24 The students were more concerned about finishing the sheet and turning the knob than reading the questions.

10/25 The below average in many cases are progressing too fast and I'm sure not understanding.

10/26 There is some problem with neighbors wanting to know how far the other is. Today there was cheating and skipping of pages to keep up with a neighbor.

10/30 One boy who was retained in third grade is up with the brightest youngster in the class. How?

11/2 A few students are not reading the questions. They seem more concerned with turning the knob to see how long a roll of paper they can use.

11/14 The slower pupils seem to be finding the program too difficult to achieve without help. They complete a unit but fail the test.

11/27 I felt that some were under the impression that the machine would learn for them rather than they learn from the machine. This feeling has changed a great deal after many of them have taken a unit over again.

1/28/63 There is a great deal of competition among the youngsters resulting in some dishonesty. They race each other.

3/27 Slow pupils still on Unit 4. Can't seem to get it even with individual help. Average students having great difficulty with Unit 10.

Several comments were made regarding the programmed materials and the boxes in which they are contained:

10/29 Today was a trying one. I had to change eight rollers and reteach the order of the boxes.

10/30 The programs would work much better if they were typed on one side only -- the pupils get the numbers all mixed up in the boxes.

10/31 Many of the students had trouble in numbering the sheets in the correct order after they had turned their unit over (when they were doing the second half of the unit). They seem to get confused in numbering after they start the second side.

12/3 Some of the boxes are getting almost impossible to use.

12/18 The entire period was spent taping up the boxes. They really are a mess and as a result the programs are getting torn.

3/4/63 The boxes are getting worse and worse.

Not all of the comments were critical. Several entries indicated praise for the programmed materials and teaching machines.

11/10 "My arm gets tired from turning this knob." "I wish we could work with the machines longer." Comments both for and against--majority of pupils like them very much.

11/13 The boys and girls are still very happy with the machines. Three of them are repeating units because of low grades. It can be discouraging.

11/15 The superior students are really advancing fast and getting things correct.

1/4/63 Children were anxious for machines again. Every child seems to like working with them.

1/15 The superior student is still thrilled about the work and doing well. The novelty seems to be wearing off for others.

1/28 Motivation continues to be very high. The pupils love the machines. Giving up a day--not using the machines--is worse than giving up recess.

2/1 I see a lot of discouragement with the slower student. Almost every unit must be repeated. Without extra attention it may do no good to repeat it. Due to a number of broken machines I don't have time to give the extra attention. The average child's test is correct but if you ask him to spell the word he can't. So I don't think they are concentrating as they should.

2/5 There has been a carry over in applying word-attack principles as the sound of loud or long vowels among the more able.

2/8 The teaching machines have been a real challenge for the more able student; those with low reading ability are having more difficulties.

2/11 Many pupils are able to get 100 per cent on the post-tests because they can distinguish the right word from the wrong word--but--when the words are pronounced for them to spell they cannot spell them correctly.

2/12 I do not believe the pupils write the entire spelling word enough. This may be the reason why they can distinguish the correct word from the incorrect. Some of the sentences or questions in the program are not very clear. Many times when pupils have the word "test" they are in doubt of what word they are to write.

2/13 Capable pupils are "sailing" right along with the units. It is serious business now. They like to progress at their own speed and learn the "big" words.

2/15 The time limit has been reduced. When the program was started it took at least 45 minutes. Now they can get the boxes and have them put away in a half hour.

2/19 The pupils think spelling by machine is fun. It has helped some children to become independent. A couple of pupils have improved their work habits and can read and follow through the directions given; which could be a carry over from the program.

3/7 The machines can handle absences well--the student can always take up where he left off. With individual instruction a student can follow the program without breaks or omissions.

3/28 Machine spelling has given more confidence and also fostered a more positive attitude toward spelling to the low-ability child as he has has the satisfying experience of being right most of the time.

5/10 The students who have finished and are working on the book-type program with no machines love it. They accomplish a great deal. They have a longer working period as no boxes to put in order, no machines to get or put away.

5/13 Although the program is well written a few students are not concentrating on the material--they are not absorbing the meat.

II. TEACHERS' EVALUATION FORMS

Teachers in the experimental group completed an evaluation form at the end of the school year. The first question asked was: "Is the subject-matter of the program academically sound?" Each of the four teachers answered yes to this. Typical of the comments of three of the four teachers was:

> The subject matter is presented in a clear, logical, and understandable manner.

The comment of the fourth teacher (a fourth grade teacher) was:

> I felt the subject-matter was academically sound, but I don't think my pupils read it well enough to understand it thoroughly. I am sure most of the class will not retain the subject-matter.

The second question was: "Was the level of the subject-matter appropriate for your class?" The two third grade teachers indicated that the materials were too difficult. One comment made was:

> Many of the children could not read the material. They answered because of sight and not understanding.

Both fourth grade teachers said that the level was appropriate. However, one added the remark:

> The program was appropriate for about a third of the class, but too difficult for the other two-thirds. Reading was the problem for them.

The next question asked was: "As contrasted with what you have been able to accomplish with other types of learning material, how much do you feel you were able to get your pupils to learn with this program?" The two fourth grade teachers checked "a great deal more than with most other materials." The two third grade teachers checked "about as much as with other materials."

Remarks made by fourth grade teachers were:

> Again I have to divide this class for comment. The top third a great deal more because they need not wait for the slow ones. But the slow ones felt no pressure therefore they didn't study to learn.

> Immediate reinforcement was perhaps the most valuable. The program also stressed reading, vocabulary, and English skills as well as spelling.

Third grade teachers added:

> The mechanics of the machines was fascinating to the children, but the majority of them missed the real learning point of the program.
>
> The superior did very well. Because of the enthusiasm over the machines the children tried hard and I do see improvement.

The next question asked: "The next time you teach a course in this subject or a similar field, would you a) prefer to have programs used for at least part of the course, b) prefer not to have programs used, or c) not care whether programs are used? Each of the four teachers indicated the first choice, that they would prefer to have programs used for at least part of the course, although the third grade teachers qualified their answers by saying if the appropriate level of material was used. One fourth grade teacher remarked:

> I would like to use a similar program for the fast learners. They need to be challenged to do more on their own. I feel that our subject matter is geared to the average learner and as a teacher I spend too much time with the slow learner.

The next question asked: "To what extent did you enjoy using this program with your class: very unenjoyable, unenjoyable, 50-50, enjoyable, very enjoyable." The two fourth grade teachers checked "very enjoyable" and the two third grade teachers checked "50-50".

The two third grade teachers remarked:

> Because of poor mechanisms and messed materials it was often not enjoyable, but the enthusiasm and hard work of most children made it enjoyable.
>
> I had little or no time for individual help or even time to check on the youngsters' progress. There was a constant need for repair, etc. with the machines.

The two fourth grade teachers said:

> It was fun to see how well the bright students learned to help themselves with only a minimum amount of guidance and to develop this inner drive to achieve which is so necessary for higher learning.
>
> Although the program kept me very busy and it required much extra time, it was gratifying to see their achievement.

"Do you think that this program should be made available for the use of teachers throughout the country?" The two third grade teachers indicated that they were not sure, adding:

> Not for third grade. I didn't think many of the third graders were ready for this type of program. It was too difficult.

The fourth grade teachers answered "yes", saying:

> Yes, if the teacher is willing to do a good job of teaching. A program such as this is not easy or an easy way out for a teacher. It requires more time than a text, as 34 pupils are at 34 places, but it is good for children and so should be good for teachers.
>
> Other teachers would have the satisfaction of having offered the pupils a course in which they can work at their own rate and in an active learning situation.

The final question asked the teachers to summarize their opinion of the program. A third grade teacher replied:

> Two excellent things about the program are materials as a whole and the enthusiasm the program gave to the children.
>
> The materials contain a lot of repetition on phonics which is good. I didn't agree with all types of test. Some units the child was to pick out the wrong word but did not have to correct it. Most of them could not spell them anyway. The correct test grade often did not mean the child had learned to spell the words. He could only recognize them. Rules and word meanings were clearly stated but because of the difficult words they didn't sink in.
>
> The superior student did well and worked hard. Most of the materials were at his level. The average and slower student missed out on important rules because they couldn't read and understand on their own. With easier material or words I think they would benefit more. Also, I think they need some classroom teaching along with the

machines. The children did benefit greatly by working on their own. You could see this in other areas of study. When assignments were given they seem to read and follow directions better.

The most unenjoyable part is the machine itself. I don't think many of them will be usable again without repair. Materials also were hard to keep in order. It would be much better if each individual had his own materials. In each class some children would spend the most time straightening boxes.

The amount of time used in getting the machines and working with them is too much. Other subjects must be cut down to give this extra time.

The children seemed to compete constantly to finish ahead of the other. Cheating was also done with the more difficult words.

Machines will certainly never take the place of the teacher. The teacher is so busy keeping the machines in working order, filling rollers with paper, and giving pre- and post-tests that she hardly has time to observe the student while he or she is working.

Another third grade teacher said:

The youngsters found it was interesting to handle and work with the mechanics of the machines. This held their interest throughout the entire program. However, the machines did not always work smoothly and this took much of the teacher's time and attention. The papers in the boxes proved to be a constant source of confusion and this increased greatly when the second set of boxes was used. It was impossible to keep the unit pages in order. This also consumed a lot of time.

It was mentioned that one advantage of the program was that each youngster could go at his own speed. Third graders are very competitive and inclined to want to be first. I found this influenced the speed at which they worked. Many of them did not work at their own speed, but at their neighbor's or friend's speed. It was a big race to see who could finish first. As a result, some of those who finished first were not above-average students. Instead they had carelessly hurried through the program.

The program was too hard for most third graders. The above-average youngster was able to grasp most of it. In going through the program, unit by unit, I, as a teacher felt the youngsters should get more out of it than they did. However, something seemed to happen between the boxes and the brain, for the majority of the youngsters did not apply what was presented in the program. Perhaps third graders are not mature enough to work that independently.

The program was very time-consuming because of the trips to and from the supply room to get the boxes. I was not able to check individually with the youngsters as they were working because my attention was needed almost entirely elsewhere, fixing boxes, finding lost pages, etc.

A fourth grade teacher replied:

Many children go through the process of memorizing the week's spelling list by monotonously writing the words over and over. The bright child may already know the words he must study. The slow child will still make mistakes on his text.

The greatest advantage is that students can go at their own pace. The student can follow a program without breaks or omissions. Working on a machine, the student can always take up where he left off. The coherence of the program helps maximize the student's success, for by thoroughly mastering one step he is optimally prepared for the next.

There appear to be gratifying "side effects" as: (1) the pupil learns to follow directions. (2) the satisfying experience of being right most of the time gives confidence and fosters a positive feeling toward spelling. (Machines are patient, they do not shame or disparage.) (3) the pupil is actively learning. (4) he acquires a feeling of independence. (5) reading is improved.

I thought it quite interesting to find out that some students could get the machine test right (picking out the correct word) but when the words were dictated they could not spell them correctly.

The machines do absolutely nothing for handwriting. When a new roll is in they have to have the machines up so high--they stand up in their desks.

The programs had some very good phonetic work included. However, I feel some students did not read it as thoroughly as they should--they seemed more concerned with writing their answer in the blank. Much time was lost in fixing the boxes or fixing the machines.

I would certainly recommend the continued use of programmed learning. In programmed learning the student remains active. If he stops, the program stops. Immediate and frequent reinforcement sustains a lively interest. Generally the students like the programs and therefore they do not let their attention wander. I realize some students need a machine but most of them could accomplish more with a book-type program. I feel the machines waste a great deal of time. (I would like working with the book-type programs and no machines and compare the results.)

> I believe this program has many aspects of learning that do not immediately show up. It certainly helps them to work on their own and compete with themselves.
>
> The program is very good for the top students--it challenges them, it takes them much farther than they could go with the class. I feel programmed learning has a great potential.

Another fourth grade teacher replied:

> The boxes and the machines were the weak spots, with so many children using the same. The machines were not strong enough to withstand the job required nor the children capable of keeping the program in order. I would like to see either the program in book form or a program per class.
>
> I would like to see a program such as this used in several areas. I feel that machine programming needs teacher or parent guidance. It is a challenge to the bright pupils not to have to wait for the average learner. I found that the average learner in this room has just "caught on" the value of such a program. At first they seemed to feel no inner drive to learn on purpose. Several made the remark that they wished they had studied like this earlier in the program. I also feel that a program like this in different areas would be of great value to the slow learner, if he could have teacher guidance early in the program, or until he understood it himself. Direct results and achievement are very rewarding to slow learners, too. I could not find time to do this as too many pupils were having difficulty.

III. SUMMARY

In summarizing the results of the written logs and end of year evaluations, it appears that several distinctions can be made. It seems that the programs and machines were better accepted at the fourth grade level than at the third grade level. The level of difficulty was, in the opinion of the teachers, more appropriate for fourth grade pupils. Also, the teaching machines themselves were better accepted at the fourth grade level.

There appeared to be better acceptance of the programmed materials (the spelling course) than there was of the teaching machines. Great difficulties were encountered in the use of the machines. Although this was more evident at the beginning of the project, it did continue throughout the entire project. It is felt that many times when the teachers said something critical of the "program" that they were in reality critizing the "machine."

There appeared to be concern on the part of each teacher that the program and machine were more appropriate for the average and above-average student. They expressed the feeling that the below average student received little help from the program.

The teachers were kept so busy fixing machines and helping students find their place in the programmed materials that there was little if any time available to help students individually with spelling or to observe students' behavior. It had been hoped that different types of observations could have been made with the focus on behavior and reaction of students. Apparently this was impossible to do because of the time involved.

Teachers felt that the motivation of the pupils remained at a high level throughout the entire experiment. They also said that there appeared to be some carry over for students as they were learning to work independently and follow directions.

CHAPTER V

ANALYSIS OF STUDENTS' EVALUATION

Students in the four classes in the Experimental Group were asked to complete a questionnaire at the end of the research project. An open-ended question was included which asked: "In your own words say what you thought of the spelling machines. What did you like about the program? What didn't you like about it, etc.?" Over 95 per cent of the students indicated they liked the machines. Several individuals indicated they liked the machines. but that they had great difficulty with them from a mechanical viewpoint.

The answers to the remaining questions are summarized in Table I, page 35. It can be said that the response by each group to each question is very positive. If these responses are representative of the students' feelings a positive attitude toward teaching machines existed at the end of the project.

There is little difference in positive response between third and fourth grade pupils. The fourth grade pupils generally gave a higher per cent response to the items referring to their like of teaching machines. One question, number four, referred to the amount of learning the students felt they had accomplished. The third grade students gave a higher per cent of positive response to this question.

TABLE I

PERCENTAGE RESULTS OF STUDENTS' EVALUATION

	Grade		
QUESTION	3	4	Total
1. If spelling machines had not been used in spelling class, I believe	(n = 59)	(n = 64)	(n = 123)
______I would have learned less in spelling	61	80	71
______It would have made no difference	22	9	15
______I would have learned more in spelling	17	11	14
2. In comparing work done using the spelling machines with studying in the textbook, I feel that, with the same amount of time and effort:	(n = 58)	(n = 63)	(n = 121)
______I learned much more with the machines	69	62	65
______I learned somewhat more with the machines	9	25	17
______I feel there is no difference	15	3	9
______I learn somewhat more from studying textbooks	7	10	8
______I learn much more from studying textbooks	0	0	0
3. If I was to take another course in this subject or a similar subject, I would:	(n = 58)	(n = 63)	(n = 121)
______Choose to have machines used for at least part of the course	72	80	76
______Choose not to have machines used	9	6	7
______Not care whether machines are used or not	19	14	17
4. How much do you think you learned from using spelling machines?	(n =57)	(n = 63)	(n = 120)
______Learned nothing	0	0	0
______Learned a little	2	2	2
______Learned a medium amount	7	21	14
______Learned quite a bit	32	27	29
______Learned very much	60	51	55
5. How much did you enjoy going through this program using the spelling machines?	(n =57)	(n = 64)	(n = 121)
______Very much disliked	4	2	2
______Disliked	2	2	2
______Don't know	18	19	18
______Enjoyable	23	31	27
______Very enjoyable	54	47	50

To summarize, it appears that through the use of multiple choice and open-ended questions, students in the Experimental Group possessed a positive feeling toward programmed materials and teaching machines at the completion of this project.

CHAPTER VI

STATISTICAL ANALYSES OF DATA

The first factor to be considered in the statistical analysis of data is the time factor involved in the research project. The total length of time used during the school year varied among the three schools. The project continued for the entire school year (38 weeks) in Control School B. In Control School A, the project was completed in 24 weeks. In the Experimental School, students progressed at individual rates and as a result the length of the project varied from 15 to 28 weeks. Some of the students in the Experimental Group did not complete the course in the 28 weeks.

The amount of time per day devoted to classroom instruction in spelling is difficult to ascertain accurately. It appears that each control group used approximately 25 minutes per day, on the average, for classroom spelling instruction. The Experimental Group used about 35 minutes per day for spelling instruction but it is estimated that approximately 10 minutes per day were devoted to carrying machines and program from room to room and reorganizing the program in the correct order after other students had used it. Therefore, it appears that the three groups used about an equal amount of time per day, on the average, if the time for storage, movement and reorganization is not considered.

Differences existed in the amount of homework assigned. Students in Control Group A appeared to receive homework in spelling regularly while students in the other two groups were not assigned homework except on an individual basis as special needs were exhibited.

Table II, page 39, gives a tabulation of the per cent of students in the Experimental Group completing various number of units. The programmed spelling course contained twelve units. It can be observed from Table II that 36 per cent of the third grade pupils and 55 per cent of the fourth grade pupils completed the entire course. Likewise, it can be seen that two per cent of the fourth grade pupils (one student) proceeded no further than Unit 3. In interpreting these figures it must be remembered that the students had to repeat units if their unit post-test score did not reach a certain level prescribed by the teacher.

Table III, page 40, describes the per cent of those who finished the course by number of weeks necessary for completion. It can be seen, for example, that 64 per cent of the third grade pupils and 44 per cent of the fourth grade pupils did not complete the programmed spelling course. Of those completing the course, 25 per cent of the third grade pupils and 38 per cent of the fourth grade pupils completed the course in 20 weeks or less.

The investigator wished to determine whether differences existed among the three groups at the beginning of the research project. Two possible variables, an intelligence score and a spelling achievement score, were selected for an analysis of variance. The Lorge-Thorndike intelligence score and the spelling subtest of the Iowa Tests of Basic Skills were used.

TABLE II

PER CENT OF STUDENTS IN EXPERIMENTAL GROUP COMPLETING VARIOUS NUMBER OF UNITS

GRADE	UNITS COMPLETED									
	3	4	5	6	7	8	9	10	11	12
3	0	4	4	11	2	5	12	16	11	36
4	2	0	3	2	0	6	9	15	8	55
TOTAL 3 & 4	1	2	3	6	1	6	11	16	9	47

TABLE III

PER CENT OF STUDENTS IN EXPERIMENTAL GROUP COMPLETING PROGRAMMED SPELLING COURSE IN VARIOUS NUMBER OF WEEKS

Number of weeks necessary for completion of course	GRADE					
	3		4		Total 3 & 4	
	Per cent of all 3rd graders	Per cent of 3rd graders who finished	Per cent of all 4th graders	Per cent of 4th graders who finished	Per cent of all 3rd & 4th graders	Per cent of 3rd and 4th graders who finished
	(n = 56)	(n = 20)	(n = 66)	(n = 37)	(n = 122)	(n = 57)
15	2	5	0	0	1	2
16	0	0	2	3	1	2
17	2	5	2	3	2	4
18	2	5	5	8	3	7
19	0	0	5	8	2	5
20	4	10	9	16	7	14
21	2	5	3	5	2	5
22	0	0	2	3	1	2
23	4	10	0	0	2	4
24	9	25	5	8	7	14
25	4	10	5	8	4	9
26	4	10	0	0	2	4
27	5	15	17	30	11	25
28	0	0	5	8	2	5
Did not complete course	64	--	44	--	53	--

To test the significance of the differences among schools, the null hypothesis was assumed. other words, a homogeneous population was postulated, from which variation among samples as reat as were present could reasonably be attributed to sampling flunctuation. A test for determing hether the null hypothesis (I. e., there is no difference) is tenable was made.

Table IV, page 42, is the analysis of variance of intelligence scores among the three groups Experimental Group and Control Group A and B). The two sections of third grade pupils and two ections of fourth grade pupils in each group are used for a total of 336 degrees of freedom. At 2 and 34 degrees of freedom, an F value of 1.07 is obtained. This is not a significant F value because at and 400 degrees of freedom (2 and 334 d. f. are needed--closest table figures are 2 and 400 d. f.) n F value of 3.02 is required for $p < .05$ and 4.66 for $p < .01$. Thus, evidence is not available for ejecting the null hypothesis or the idea that students in the various schools do not differ in in-elligence scores as represented by the test.

Tables V and VI, pages 43 and 44, contain analyses of variance of intelligence scores mong schools but in Table V the data is for third grade pupils only and Table VI contains data or fourth grade pupils only. At the third grade level, an F value is obtained which is not stat-stically significant. Therefore, the idea that there are no differences between third grade pupils mong schools cannot be rejected. The null hypothesis is sustained. However, at the fourth grade evel the differences are significant at the five per cent level of confidence. The mean IQ scores or fourth grade pupils are 111.12 at the Experimental School, 113.29 at Control School A, and 08.26 at Control School B. This would indicate that an analysis of covariance should be used n the analysis of the data. However, simple "t" tests will be made and, therefore, the small ifferences which do exist should be recognized and noted in the interpretation of the "t" tests.

The other possible variable with which there was concern was spelling achievement cores. The analysis of variance for the spelling subtest of the Iowa Tests of Basic Skills is

TABLE IV

ANALYSIS OF VARIANCE OF LORGE-THORNDIKE INTELLIGENCE SCORES AMONG THREE SCHOOLS (THIRD AND FOURTH GRADE)

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square
Schools	2	413	206.5
Within	334	64,307	192.5
Total	336	64,720	(192.6)

$$F_{2,334} = \frac{206.5}{192.5} = 1.07 \text{ (n.s.)}$$

(At 2 and 400 degrees of freedom, an F value of 3.02 is required for $p < .05$ and 4.66 for $p < .01$.)

TABLE V

ANALYSIS OF VARIANCE OF LORGE-THORNDIKE INTELLIGENCE SCORES AMONG THREE SCHOOLS (THIRD GRADE ONLY)

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square
Schools	2	104	52.0
Within	155	18,362	118.0
Total	157	18,466	(117.6)

$$F_{2,155} = \frac{52.0}{118.5} = 0.44 \text{ (n.s.)}$$

(At 2 and 400 degrees of freedom, an F value of 3.02 is required for $p < .05$ and 4.66 for $p < .01$.)

TABLE VI

ANALYSIS OF VARIANCE OF LORGE-THORNDIKE INTELLIGENCE SCORES AMONG THREE SCHOOLS (FOURTH GRADE ONLY)

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square
Schools	2	755	377.5
Within	176	20,512	116.5
Total	178	21,267	(119.5)

$$F_{2,176} = \frac{377.5}{116.5} = 3.24 \text{ (n.s.)}$$

(At 2 and 400 degrees of freedom, an F value of 3.02 is required for $p < .05$ and 4.66 for $p < .01$.)

described in Table VII, page 46. An F value of 2.30 is obtained. Since this F value is not statistically significant the null hypothesis that there are no differences in spelling achievement as represented by these test scores cannot be rejected. It must be sustained.

Tables VIII and IX, pages 47 and 48 contain analyses of variance for the spelling subtest. Table VIII describes the analysis for third grade pupils only while Table IX contains the data for fourth grade pupils only. In each case an F value has been obtained which is not statistically significant. Therefore, the null hypothesis cannot be rejected.

The above data is included to indicate that the three groups were equal in intelligence (except at the fourth grade level) and spelling achievement at the beginning of the experiment in so far as the test scores were representative of intelligence and spelling achievement. There are other possible variables which could have been included but these are the two which were the most important, it is felt.

In addition to the analysis of the control variables, analyses of variance were made on the pre tests of the five criteria tests. Tables X, XI, XII, XIII, and XIV, pages 49 to 53, list the F values for the analyses of the How I Like School Inventory, National Achievement Tests in Spelling, word list from programmed spelling course, word list to measure transfer of spelling skills, and rules of spelling test, respectively. In the case of three of the criteria tests, F values were obtained which are not statistically significant. Therefore, the null hypothesis can not be rejected and it can not be said that differences existed among the groups at the beginning of the experiment in these three tests.

However, differences significant $<.05$ were computed for the How I Like School Inventory and differences significant $<.001$ was computed for the rules of spelling test. The mean scores of the rules of spelling test are 30.2 for Experimental School, 36.7 for Control School A, and 32.1 for Control School B. These differences need to be considered in the interpretation of the "t" tests.

TABLE VII

ANALYSIS OF VARIANCE OF IOWA TEST OF BASIC SKILLS SPELLING SUBTEST AMONG THREE SCHOOLS (THIRD AND FOURTH GRADE)

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square
Schools	2	571	285.5
Within	326	40,487	124.2
Total	328	41,058	(125.2)

$$F_{2,326} = \frac{285.5}{124.2} = 2.30 \text{ (n.s.)}$$

(At 2 and 400 degrees of freedom, an F value of 3.02 is required for $p < .05$ and 4.66 for $p < .01$.)

TABLE VIII

ANALYSIS OF VARIANCE OF IOWA TEST OF BASIC SKILLS SPELLING SUBTEST AMONG SCHOOLS (THIRD GRADE ONLY)

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square
Schools	2	114	57.0
Within	150	20,861	139.1
Total	152	20,975	(138.0)

$$F_{2,150} = \frac{57.0}{139.1} = 0.41 \text{ (n.s.)}$$

(At 2 and 400 degrees of freedom, an F value of 3.02 is required for $1 < .05$ and 4.66 for $p < .01$.)

TABLE IX

ANALYSIS OF VARIANCE OF IOWA TESTS OF BASIC SKILLS SPELLING SUBTEST AMONG SCHOOLS (FOURTH GRADE ONLY)

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square
Schools	2	206	103.0
Within	173	32,006	185.0
Total	175	32,212	(184.1)

$$F_{2,173} = \frac{103.0}{185.0} = 0.56 \text{ (n.s.)}$$

(At 2 and 400 degrees of freedom, an F value of 3.02 is required for $p < .05$ and 4.66 for $p < .01$.)

TABLE X

ANALYSIS OF VARIANCE OF "HOW I LIKE SCHOOL" INVENTORY AMONG SCHOOLS (THIRD AND FOURTH GRADE PUPILS)

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square
Schools	2	233	116.5
Within	328	11,634	35.5
Total	330	11,867	(36.0)

$$F_{2,328} = \frac{116.5}{35.5} = 3.28 \text{ (n.s.)}$$

(At 2 and 400 degrees of freedom, an F value of 3.02 is required for $p < .05$ and 4.66 for $1 < .01$.)

TABLE XI

ANALYSIS OF VARIANCE OF NATIONAL ACHIEVEMENT TEST IN SPELLING AMONG SCHOOLS (THIRD AND FOURTH GRADE PUPILS)

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square
Schools	2	839	419.5
Within	331	50,679	153.1
Total	333	51,518	(154.7)

$$F_{2,331} = \frac{419.5}{153.1} = 2.74 \text{ (n.s.)}$$

(At 2 and 400 degrees of freedom, and F value of 3.02 is required for $p < .05$ and 4.66 for $p < .01$.)

TABLE XII

ANALYSIS OF VARIANCE OF WORD LIST FROM PROGRAMMED SPELLING COURSE AMONG SCHOOLS (THIRD AND FOURTH GRADE PUPILS)

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square
Schools	2	378	189.0
Within	333	29,437	88.4
Total	335	29,815	(89.0)

$$F_{2,333} = \frac{189.0}{88.4} = 2.14 \text{ (n.s.)}$$

(At 2 and 400 degrees of freedom, an F value of 3.02 is required for $p < .05$ and 4.66 for $p < .01$.)

TABLE XIII

ANALYSIS OF VARIANCE OF WORD LIST TO MEASURE TRANSFER OF SPELLING SKILLS AMONG SCHOOLS (THIRD AND FOURTH GRADE PUPILS)

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square
Schools	2	487	243.5
Within	269	23,550	87.5
Total	271	24,037	(88.7)

$$F_{2,269} = \frac{243.5}{87.5} = 2.78 \text{ (n.s.)}$$

(At 2 and 400 degrees of freedom, an F value of 3.02 is required for $p < .05$ and 4.66 for $p < .01$.)

TABLE XIV

ANALYSIS OF VARIANCE OF TEST ON RULES OF SPELLING AMONG SCHOOLS (THIRD AND FOURTH GRADE PUPILS)

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square
Schools	2	2,208	1104.0
Within	331	41,471	125.3
Total	333	43,679	(131.2)

$$F_{2,331} = \frac{1104}{1253} = .8\ 81 \text{ (n.s.)}$$

(At 2 and 400 degrees of freedom, an F value of 3.02 is required for $p < .05$ and 4.66 for $p < .01$.)

Tables XV, XVI, XVII, XVIII, and XIX, pages 55 to 59, contain the statistical data describing the pre- and post-test results of each of the five criteria instruments. Each table lists the differences between pre- and post-test results, standard deviations, "t" test, and probability. Results are tabulated by school, grade level, and ability group within grade level as determined by an intelligence test score.

Data relative to the How I Like School inventory are contained in Table XV. This inventory is a device whereby pupils express their likes and dislikes about school by answering "Yes" or "No" to 50 questions. It, like all of the other criteria instruments, was administered at the beginning and again at the termination of the project. It can be observed from Table XV that little gain was made during the year's time on this instrument. In several instances the difference between pre- and post-test scores was negative. For schools, the only statistically significant gain was with the total third and fourth grade class at Lincoln ($p < .05$). By grade levels, statistically significant gains were made at the third grade level, low third in ability, at Lincoln ($p < .01$); the total third grade at Lincoln ($p < .01$); and the fourth grade level, top third in ability, at Emerson ($p < .001$).

It can be said that based on the data contained in Table XV there was little change in students in any of the three schools in attitude toward school as measured by the How I Like School inventory. Some isolated gains were made but these were few in number.

The results of the National Achievement Tests in spelling are tabulated in Table XVI. Statistically significant gains were made at most grade and

TABLE XV

A COMPARISON OF PRE AND POST TEST SCORES ON THE HOW I LIKE SCHOOL INVENTORY BETWEEN EXPERIMENTAL AND CONTROL GROUPS

GRADE	Level of Groups (by Intelligence) 1-Top Third 2-Middle Third 3-Lower Third	NUMBER			MEAN SCORES ($\bar{X}$)									"t"			PROBABILITY		
		Lincoln	Emerson	Cleveland	Lincoln			Emerson			Cleveland			Lincoln	Emerson	Cleveland	Lincoln	Emerson	Cleveland
					1	2	3	1	2	3	1	2	3						
3	1	17	15	18	40.1	43.5	3.4	40.2	38.6	-1.6	41.8	43.5	1.7	1.6683	0.5776	1.5043	n.s.	n.s.	n.s.
	2	16	15	19	38.8	42.4	3.6	38.7	38.3	-0.4	40.6	41.1	0.5	1.5000	0.1650	0.4444	n.s.	n.s.	n.s.
	3	18	15	18	36.9	42.4	5.5	36.5	35.6	-0.9	39.9	39.2	-0.7	2.9781	0.3275	0.2963	<.01	n.s.	n.s.
	Total	51	45	55	38.6	42.8	4.2	38.4	37.6	-0.8	40.8	41.3	0.5	3.4917	0.4966	0.5051	<.001	n.s.	n.s.
4	1	18	19	22	42.3	43.2	0.9	32.7	43.7	11.0	42.8	43.5	0.7	0.5754	4.0072	0.5489	n.s.	<.001	n.s.
	2	18	19	22	39.2	39.7	0.5	43.8	42.5	-1.3	43.6	42.8	-0.8	0.2446	1.1008	0.4425	n.s.	n.s.	n.s.
	3	17	20	22	40.8	38.5	-2.3	43.2	41.8	-1.4	41.3	39.2	-2.1	0.6774	0.7258	0.9727	n.s.	n.s.	n.s.
	Total	53	58	66	40.8	40.5	-0.3	42.7	43.4	0.7	42.6	41.8	-0.8	0.2830	0.5083	0.6822	n.s.	n.s.	n.s.
3 & 4	1	35	34	40	41.2	43.3	2.1	41.9	41.5	-0.4	42.3	43.5	1.2	1.7583	0.2040	1.3146	n.s.	n.s.	n.s.
	2	34	34	41	39.0	40.9	1.9	41.4	40.8	-0.6	42.2	42.0	-0.2	1.2905	0.4307	0.1579	n.s.	n.s.	n.s.
	3	35	35	40	38.8	40.5	1.7	40.3	39.1	-1.2	40.7	39.2	-1.5	1.1342	0.6610	0.9091	n.s.	n.s.	n.s.
	Total	104	103	121	39.7	41.6	1.9	40.8	40.9	0.1	41.7	41.6	-0.1	2.3580	0.1000	0.2313	<.05	n.s.	n.s.

(Column 1 = Pre Test Mean Score, 2 = Post Test Mean Score, 3 = Difference In Mean Scores. All scores are raw scores. At 60 df, a "t" value of 2.000 is required for $p<.05$, 2.660 for $p<.01$, and 3.460 for $p<.001$. At 20 df, a "t" value of 2.086 is required for $p<.05$, 2.845 for $p<.01$, 3.850 for $p<.001$. All values of "t" indicated above are between pre test and post test mean scores for school and level shown.)

TABLE XVI

A COMPARISON OF PRE AND POST TEST SCORES ON THE NATIONAL ACHIEVEMENT TEST IN SPELLING BETWEEN EXPERIMENTAL AND CONTROL GROUPS

GRADE	Level of Groups (by Intelligence) 1-Top Third 2-Middle Third 3-Lower Third	NUMBER			MEAN SCORES (X)									"t"			PROBABILITY		
		Lincoln	Emerson	Cleveland	Lincoln			Emerson			Cleveland			Lincoln	Emerson	Cleveland	Lincoln	Emerson	Cleveland
					1	2	3	1	2	3	1	2	3						
3	1	18	16	19	18.3	35.7	17.4	21.7	33.8	12.1	19.6	30.3	10.7	4.9127	3.4655	3.1826	<.001	<.01	<.01
	2	15	15	19	18.4	35.8	17.4	19.3	31.0	11.7	16.5	27.0	10.5	4.4051	3.2493	2.6391	<.001	<.01	<.05
	3	18	15	19	13.2	30.6	17.4	15.3	22.5	7.2	13.2	24.7	11.5	4.6005	1.3891	3.0912	<.001	n.s.	<.01
	Total	51	46	57	16.5	33.9	17.4	18.3	29.2	10.9	16.4	27.3	10.9	7.9862	4.1862	5.0417	<.001	<.001	<.001
4	1	18	19	22	38.1	44.9	6.8	38.7	44.2	5.5	33.3	44.8	11.5	4.0655	3.3827	8.2500	<.001	<.01	<.001
	2	18	19	22	22.6	34.6	12.0	33.3	40.6	7.3	30.9	41.5	10.6	1.3794	3.5833	5.0190	n.s.	<.01	<.001
	3	17	20	22	16.9	28.9	12.0	19.9	31.3	11.4	16.6	33.2	16.6	3.0075	5.5366	6.0993	<.01	<.001	<.001
	Total	53	58	66	26.1	36.3	10.2	30.5	38.6	8.1	26.9	39.8	12.9	4.4242	4.8214	7.8659	<.001	<.001	<.001
3 & 4	1	36	35	41	28.2	40.3	12.1	30.9	39.4	8.5	27.0	38.1	11.1	4.5299	3.4372	4.7725	<.001	<.01	<.001
	2	33	34	41	20.7	35.1	14.4	27.1	36.4	9.3	24.2	34.8	10.6	5.5676	3.8264	3.9328	<.001	<.001	<.001
	3	35	35	41	15.0	29.8	14.8	17.9	27.5	9.6	15.0	29.3	14.3	5.4106	3.6873	6.0638	<.001	<.001	<.001
	Total	104	104	123	21.4	35.1	13.7	25.3	34.4	9.1	22.1	34.0	11.9	8.2771	5.6460	7.8684	<.001	<.001	<.001

(Column 1 = Pre Test Mean Score, 2 = Post Test Mean Score, 3 = Difference in Mean Scores. All scores are raw scores. At 60 df, a "t" value of 2.000 is required for $p<.05$, 2.660 for $p<.01$, and 3.460 for $p<.001$. At 20 df, a "t" value of 2.086 is required for $p<.05$, 2.845 for $p<.01$, 3.850 for $p<.001$. All values of "t" indicated above are between pre test and post test mean scores for school and level shown.)

TABLE XVII

A COMPARISON OF PRE AND POST TEST SCORES ON THE TEST ON WORD LIST FROM PROGRAMMED SPELLING COURSE BETWEEN EXPERIMENTAL AND CONTROL GOUPS

GRADE	Level of Groups (by Intelligence) 1-Top Third 2-Middle Third 3-Lower Third	NUMBER			MEAN SCORES (X̄)									"t"			PROBABILITY		
		Lincoln	Emerson	Cleveland	Lincoln			Emerson			Cleveland			Lincoln	Emerson	Cleveland	Lincoln	Emerson	Cleveland
					1	2	3	1	2	3	1	2	3						
3	1	18	16	19	16.4	30.8	14.4	17.7	31.4	13.7	15.7	26.7	11.0	5.2904	4.8892	3.8869	<.001	<.001	<.001
	2	16	15	19	14.8	28.4	13.6	16.3	30.4	14.1	14.1	24.1	10.0	4.5482	4.5387	3.3023	<.001	<.001	<.01
	3	18	15	19	12.0	26.2	14.2	14.0	21.9	7.9	10.2	21.9	11.7	4.7559	1.9101	4.0729	<.001	n.s.	<.001
	Total	52	46	57	14.4	28.5	14.1	16.0	28.0	12.0	13.3	24.2	10.9	8.3491	5.9304	6.4059	<.001	<.001	<.001
4	1	18	19	22	29.2	34.9	5.7	30.5	38.4	7.9	27.8	37.8	10.0	4.8889	6.6949	8.8496	<.001	<.001	<.001
	2	18	19	22	19.1	28.7	9.6	26.7	36.4	9.7	26.1	35.5	9.4	5.0052	6.8239	7.0149	<.001	<.001	<.001
	3	17	20	22	15.9	22.9	7.0	17.3	32.0	14.7	17.3	29.9	12.6	2.6148	9.7351	6.9290	<.05	<.001	<.001
	Total	53	58	66	21.5	29.0	7.5	24.7	35.5	10.8	23.7	34.4	10.7	4.8954	9.5000	9.6126	<.001	<.001	<.001
3 & 4	1	36	35	41	22.8	32.9	10.1	24.6	35.2	10.6	22.2	32.6	10.4	5.4620	5.6064	7.4922	<.001	<.001	<.001
	2	34	34	41	17.0	28.6	11.6	22.1	33.7	11.6	20.5	30.2	9.7	6.5682	6.2193	4.7822	<.001	<.001	<.001
	3	35	35	41	13.9	24.6	10.7	15.9	27.6	11.7	14.0	26.2	12.2	5.2647	5.5258	6.6413	<.001	<.001	<.001
	Total	105	104	123	18.0	28.7	10.7	20.9	32.2	11.3	18.9	29.7	10.8	9.0504	9.9123	9.1356	<.001	<.001	<.001

(Column 1 = Pre Test Mean Score, 2 = Post Test Mean Score, 3 = Difference in Mean Scores. All scores are raw scores. At 60 df, a "t" value of 2.000 is required for $p < .05$, 2.660 for $p < .01$, and 3.460 for $p < .001$. At 20 df, a "t" value of 2.086 is required for $p < .05$, 2.845 for $p < .01$, 3.850 for $p < .001$. All values of "t" indicated above are between pre test and post test mean scores for school and level shown.)

TABLE XVIII

A COMPARISON OF PRE AND POST TEST SCORES ON THE TEST ON RULES OF SPELLING BETWEEN EXPERIMENTAL AND CONTROL GROUPS

GRADE	Level of Groups (by Intelligence) 1-Top Third - 2-Middle Third 3-Lower Third	NUMBER			MEAN SCORES (X)									"t"			PROBABILITY		
					Lincoln			Emerson			Cleveland								
		Lincoln	Emerson	Cleveland	1	2	3	1	2	3	1	2	3	Lincoln	Emerson	Cleveland	Lincoln	Emerson	Cleveland
3	1	18	16	18	33.9	51.4	17.5	35.4	50.8	15.4	29.6	47.5	17.9	6.4338	5.6313	5.3086	<.001	<.001	<.001
	2	17	15	19	29.9	50.7	20.8	32.9	48.1	15.2	26.4	45.7	19.3	6.0378	5.4676	6.0344	<.001	<.001	<.001
	3	18	15	19	26.5	45.0	18.5	26.7	34.9	8.2	20.1	39.2	19.1	4.8052	1.4437	6.3654	<.001	n.s.	<.001
	Total	53	46	56	30.1	49.0	18.9	31.7	44.7	13.0	25.3	44.1	18.8	9.4925	5.2000	9.6907	<.001	<.001	<.001
4	1	18	19	22	42.2	53.6	11.4	48.3	59.5	11.2	41.2	60.1	18.9	5.4760	7.9366	11.9050	<.001	<.001	<.001
	2	18	19	22	31.2	42.2	11.0	41.3	53.5	12.2	36.0	55.1	19.1	3.3084	6.4603	7.2159	<.001	<.001	<.001
	3	15	20	21	28.3	38.9	10.6	32.8	49.8	17.0	25.3	46.1	20.8	3.0199	7.2863	7.4464	<.01	<.001	<.001
	Total	51	58	65	34.2	45.3	11.1	40.6	54.2	13.6	34.4	54.0	19.6	5.2524	9.1689	11.1657	<.001	<.001	<.001
3 & 4	1	36	35	40	38.1	52.5	14.4	42.4	55.5	13.1	36.2	54.6	18.4	7.8478	6.6853	8.2883	<.001	<.001	<.001
	2	35	34	41	30.6	46.3	15.7	37.6	51.1	13.5	31.5	50.7	19.2	6.3846	7.4751	8.4079	<.001	<.001	<.001
	3	33	35	40	27.3	42.2	14.9	30.1	43.4	13.3	22.8	42.9	20.1	5.6053	4.3475	9.3692	<.001	<.001	<.001
	Total	104	104	121	32.1	47.2	15.1	36.7	50.0	13.3	30.2	49.4	19.2	10.2945	8.7632	13.3333	<.001	<.001	<.001

(Column 1 = Pre Test Mean Score, 2 = Post Test Mean Score, 3 = Difference in Mean Scores. All scores are raw scores. At 60 df, a "t" value of 2.000 is required for $p < .05$, 2.660 for $p < .01$, and 3.460 for $p < .001$. At 20 df, a "t" value of 2.086 is required for $p < .05$, 2.845 for $p < .01$, 3.850 for $p < .001$. All values of "t" indicated above are between pre test and post test mean scores for school and level shown.)

TABLE XIX

A COMPARISON OF PRE AND POST TEST SCORES ON THE TEST ON WORD LIST TO MEASURE TRANSFER OF SPELLING SKILLS BETWEEN EXPERIMENTAL AND CONTROL GROUPS

GRADE	Level of Groups (by Intelligence) 1-Top Third 2-Middle Third 3-Lower Third	NUMBER			MEAN SCORES ($\bar{X}$)									"t"			PROBABILITY		
		Lincoln	Emerson	Cleveland	Lincoln			Emerson			Cleveland			Lincoln	Emerson	Cleveland	Lincoln	Emerson	Cleveland
					1	2	3	1	2	3	1	2	3						
3	1	18	15	18	16.1	30.2	14.1	16.7	31.0	14.3	17.2	28.1	10.9	4.4936	5.4280	3.8521	<.001	<.001	<.01
	2	16	15	19	17.6	29.7	12.1	17.6	30.3	12.7	13.6	24.8	11.2	4.5261	7.0369	3.4329	<.001	<.001	<.01
	3	18	15	18	12.7	24.6	11.9	12.9	23.3	10.4	11.3	23.9	12.6	4.0000	2.5700	4.1316	<.001	<.05	<.001
	Total	52	45	55	15.4	28.1	12.7	15.7	28.2	12.5	14.0	25.6	11.6	7.3468	6.5497	6.5056	<.001	<.001	<.001
4	1	18		22	31.6	37.5	5.9				27.6	38.2	10.6	4.4962		7.7868	<.001		<.001
	2	18		22	19.8	28.2	8.4				26.4	36.7	10.3	4.0531		6.4099	<.001		<.001
	3	16		22	15.6	22.5	6.9				15.9	31.0	15.1	2.2754		8.6023	<.05		<.001
	Total	51		66	23.0	30.1	7.1				23.3	35.3	12.0	4.3434		10.1008	<.001		<.001
3 & 4	1	36		40	23.8	33.8	10.0				22.9	33.7	10.8	4.5045		5.7796	<.001		<.001
	2	34		41	18.8	29.0	11.2				20.4	31.2	10.8	6.1145		4.8468	<.001		<.001
	3	34		40	14.1	23.6	9.5				13.8	27.8	14.0	4.5166		7.8483	<.001		<.001
	Total	103	45	121	19.2	29.2	10.0				19.1	30.9	11.8	7.9920		9.9244	<.001		<.001

(Column 1 = Pre Test Mean Score, 2 = Post Test Mean Score, 3 = Difference in Mean Scores. All scores are raw scores. At 60 df, a "t" value of 2.000 is required for p<.05, 2.660 for p<.01, and 3.460 for p<.001. At 20 df, a "t" value of 2.086 is required for p<.05, 2.845 for p<.01, 3.850 for p<.001. All values of "t" indicated above are between pre test and post test mean scores for school and level shown.)

ability levels. The greatest gain for school was made by Lincoln with 13.9 raw score units (compared to 9.1 for Emerson and 11.9 for Cleveland). The greatest gain for third grade was made at Lincoln with 17.4 points (compared to 10.9 each for Emerson and Cleveland). Students at Cleveland made the greatest gain at fourth grade with 12.9 points (compared to 10.2 at Lincoln and 8.1 at Emerson).

At the third grade level, each of the three ability groups at Lincoln made equal gain. The top third at Emerson and the low third at Cleveland made the greatest gain within their respective schools among ability groups at the third grade level.

At the fourth grade level, the middle and low thirds made equal greatest gain at Lincoln. At Emerson and Cleveland the low thirds made the greatest gain at the fourth grade level.

Table XVII contains the data relative to the word list from the programmed course in spelling. Analysis of variance of the three schools showed them to be equal on the results of this test at the beginning of this study. Data in Table XVII indicate that statistically significant gains were made by most ability levels at both grade levels. The greatest gain by school was made at Emerson with 11.3 raw score points of gain (compared to 10.8 for Cleveland and 10.7 for Lincoln). Students at Lincoln made the greatest gain at the third grade level with 14.1 points (compared to 12.0 points at Emerson and 10.9 at Cleveland). The greatest gain at the fourth grade level was made at Emerson with 10.8 points (followed by Cleveland with 10.7 points and Lincoln with 7.5 points).

Data relative to the rules of spelling test are contained in Table XVIII. Analysis of variance of the three schools determined them not to be equal in the results of this test at the beginning of the project. Statistically significant gains were made by most ability groups at both grade levels. The greatest gain by school was made a Cleveland with 19.2 raw score points (compared to 15.1 at Lincoln and 13.3 at Emerson). Students at Lincoln made the greatest gain at the third grade level with 18.9 points (compared to 18.8 at Cleveland and 13.0 at Emerson). Greatest gain at the fourth grade level was made at Cleveland with a mean gain of 19.6 points (compared to 13.6 points at Emerson and 11.1 at Lincoln).

The results of the word list test to measure transfer of spelling skills are contained in Table XIX. Analysis of variance among schools revealed them to be equal on this test at the beginning of the study. Statistically significant gains were made by all ability groups at all grade levels except at Emerson. The pre-testing was not accomplished at the fourth grade level at Emerson. Therefore, comparisons cannot be made with this group. The greatest gain by school was made at Cleveland with 11.8 raw score points (compared to 10.0 at Lincoln). The greatest gain in the third grade was made at Lincoln with 12.7 points (compared to 11.6 for Cleveland and 12.5 for Emerson). Cleveland made the greatest gain at the fourth grade level with 12.0 points (compared to 7.1 for Lincoln).

The following analysis excludes the results of the How I Like School inventory but includes the other criteria tests. Considering total population included in the study in each school, Lincoln made the greatest gain on one test, Emerson on one test, and Cleveland on two tests. At the third grade level, Lincoln made the greatest gain in three tests and Emerson in the other. At the fourth grade level, Lincoln made the greatest gain on one test and Cleveland on the other three tests. However, it should be observed that the differences among schools were very small in many instances and were not great enough to be statistically significant.

Considering the greatest gain made by an ability group within each school, the following analysis could be made. Grade levels three and four and the total for three and four (schools) were divided into three ability groups. Four criteria tests are being considered. Therefore, each ability group within each school had 12 chances of making the greatest gain (the third grade had one chance in each of the four tests, the fourth grade one chance in each of the four tests, and the total third and fourth one chance in each of the four tests). At Lincoln there are only eleven chances because of a tie. It can be observed that the greatest gain at Lincoln was made by the top ability group three out of eleven times; the middle group, seven out of eleven times; and the low ability group, two out of eleven times.

At Emerson there are only seven chances because one pre-test was not administered. The greatest gain was made by the top ability group two out of seven times; the middle group, two out of seven times; and the low group, three out of seven times. At Cleveland, the greatest gain was made by the middle ability group one out of twelve times and the low ability group eleven out of twelve times.

Another analysis of the results of these four criteria tests would include the data in Tables XX, XXI, XXII, XXIII, pages 64 to 67. Table XX, for example, contains data for each school, grade level, and ability group for the National Achievement Tests in spelling. The tabulation is based on a ratio of gain/pre-test score. It is difficult to interpret the meaning of these ratios but they do provide another means of comparison. How much gain a student makes depends not only on his pre-test score but also on the limits of the test. How much gain was possible? It can be observed that in each of the Tables XX to XXIII, the biggest ratio exists, for the most part, in the low ability group.

In summarizing the results of these four criteria tests, it can be said that no school did consistently better than the other two schools. It is interesting to note that on two of the criteria tests directly related to the programmed course in spelling (see Tables XVII and XVIII) the Control Group B (Lincoln) made as much or more gain as the two schools which studied the material. However, the differences in gain among schools were not statistically significant. On the other hand, the differences in scores among schools at the beginning of the project were not statistically significant. Yet, each school made statistically significant gains at both grade levels in most ability groups.

TABLE XX

ANALYSIS OF GAIN ON THE NATIONAL ACHIEVEMENT TESTS IN SPELLING

Grade Level	Ability Level	Ratio of Mean Gain to Mean Pre Test Score		
		Lincoln	Emerson	Cleveland
3	1	.95	.56	.55
	2	.95	.61	.64
	3	1.32	.47	.87
	Total	1.15	.60	.67
4	1	.18	.14	.35
	2	.53	.22	.33
	3	.71	.57	1.00
	Total	.39	.27	.48
3 & 4	1	.43	.27	.41
	2	.70	.34	.44
	3	.99	.54	.95
	Total	.64	.36	.54

TABLE XXI

ANALYSIS OF GAIN ON THE TEST ON WORD LIST FROM PROGRAMMED SPELLING COURSE

Grade Level	Ability Level	Ratio of Mean Gain to Mean Pre Test Score		
		Lincoln	Emerson	Cleveland
3	1	.88	.77	.70
	2	.92	.87	.71
	3	1.18	.56	1.15
	Total	.98	.75	.82
4	1	.20	.26	.36
	2	.50	.36	.36
	3	.44	.85	.73
	Total	.35	.44	.45
3 & 4	1	.44	.43	.47
	2	.68	.53	.47
	3	.77	.74	.87
	Total	.59	.54	.57

TABLE XXII

ANALYSIS OF GAIN ON THE TEST ON RULES OF SPELLING

Grade Level	Ability Level	Ratio of Mean Gain to Mean Pre Test Score		
		Lincoln	Emerson	Cleveland
3	1	.52	.44	.61
	2	.70	.46	.73
	3	.70	.31	.95
	Total	.63	.41	.74
4	1	.27	.23	.46
	2	.35	.30	.53
	3	.37	.52	.82
	Total	.32	.34	.57
3 & 4	1	.38	.31	.50
	2	.51	.36	.61
	3	.55	.44	.88
	Total	.47	.36	.64

TABLE XXIII

ANALYSIS OF GAIN ON THE TEST ON WORD LIST TO MEASURE TRANSFER OF SPELLING SKILLS

Grade Level	Ability Level	Ratio of Mean Gain to Mean Pre Test Score		
		Lincoln	Emerson	Cleveland
3	1	.88	.86	.63
	2	.69	.72	.82
	3	.94	.81	1.11
	Total	.82	.80	.83
4	1	.19		.38
	2	.42		.39
	3	.44		.95
	Total	.31		.52
3 & 4	1	.42		.47
	2	.60		.53
	3	.67		1.02
	Total	.52		.62

CHAPTER VII

CONCLUSIONS

The purpose of this research project was to determine the effectiveness of programmed materials and teaching machines in teaching spelling to third and fourth grade pupils. In order to do this, three elementary schools were selected to act as experimental and control groups. The Experimental Group (Cleveland School) used programmed materials and teaching machines; Control Group A (Emerson) used neither programmed materials nor teaching machines but did use the word list from the programmed spelling course as the basis of instruction using conventional methods; Control Group B (Lincoln) used neither programmed materials, teaching machines nor the word list from the programmed spelling course but used the conventional methods and materials used in the other 17 elementary schools not in the research project.

A descriptive analysis of the program was made through the use of teachers' and students' reports and evaluations. An analysis of variance was made for each of two possible variables considered, intelligence scores and spelling achievement scores. Also, an analysis of variance was made for each of the five criteria instruments used in the study. Tests of statistical significance were made to test the gain made by each group. The tests of significance were made on total groups, by grade level, and by ability groups based on intelligence scores.

Following are some of the conclusions reached as a result of this study:

1. Teachers in the experimental group felt that the level of difficulty of the programmed spelling course was for average and above average fourth grade pupils. They felt that it was too difficult for average third grade pupils.
2. Teachers felt that the programmed spelling course was appropriately written, making good use of phonics and repetition.
3. Teachers felt that the mechanics of the programmed spelling course could be improved greatly. The numbering system is difficult for students to follow. Printing frames on both sides of the paper increased the difficulty. The boxes are not strong enough to stand continued use by elementary school pupils.
4. After use for approximately 28 weeks by two sections of third grade pupils and two sections of fourth grade pupils, the programs are no longer usable, even though students wrote their answers on a roll of tape in an Answer-Mate and not on the program.
5. Teachers felt that the teaching machines are cumbersome, difficult to write on, and should be improved from a mechanical viewpoint. The pages of the program frequently are twisted, folded, and torn as they are turned through the machine. Frequently the pages are jammed between the rollers. Teachers felt that they spent more of their time being mechanics than they did in teaching spelling.
6. After use for approximately 28 weeks by two sections each of third and

fourth grade pupils, many of the machines need new rollers before they can be used again. The frames of the machine are durable and usable. The difficulty seems to be with the roller system.

7. Teachers felt that they devoted the majority of their time to fixing machines, helping students place the pages of the program in order, and administering the unit pre- and post-tests. As a result, they had little if any time to devote to giving students individual help in spelling.
8. As a result of the improper functioning of the teaching machines and the difficulty in handling the programmed materials, many of the students and teachers appeared to be somewhat frustrated. This was evidenced especially during the first three to four weeks of the project. It did continue to a lesser degree throughout the project.
9. Despite everything else indicated, the teachers said they enjoyed using the programmed materials and teaching machines, and said that their students enjoyed using them also. They did make recommendations for changes if the program is to be continued.
10. Teachers said that they would like to continue to use programmed materials but in the textbook format, without the use of teaching machines.
11. Teachers said that the motivation of the students was at a high level and that this continued throughout the entire project.
12. Teachers said that some of the students hurried through the program and seemed to be more interested in finishing before their neighbors than in learning spelling.
13. Teachers said that they felt that a carry-over or transfer value was indicated

as a possibility as they noticed that students were able to follow directions better and work independently on other projects.

14. Teachers said that they felt that with the use of programmed materials it was easier to handle make-up work caused by absences.

15. Teachers said that they felt that handwriting did not improve as a result of the students writing on paper on top of the machine. They said that possibly the students' handwriting deteriorated.

16. Some fear had once been expressed in certain quarters that teaching machines would replace teachers. This fear should have been dispelled after this project was completed. It appeared that the teacher's work load was increased considerably as a result of using programmed materials and teaching machines.

17. The differences among schools and grade levels among schools were not statistically significant at the beginning of the project. Each school and grade level and most ability groups within made statistically significant gains. However, only a small amount of differences existed among groups at the conclusion of the study. The differences among schools were not statistically significant.

18. Based on the statistical data reported, it is difficult to say that any method is superior to any other method. It does appear, however, that contrary to statements made by teachers, the low ability group was helped the most at the experimental school and the top and middle ability groups were helped the most at the control school. Students in the Experimental Group made the greatest amount of gain on two of the four achievement tests used.

As a result of this study, the following recommendations are made:

1. That further studies be made relative to the use of programmed materials and teaching machines.
2. That teaching machines not be used with an entire class at lower than the fourth grade level.
3. That use of programmed materials in the textbook format be considered. It appears that the best use of programmed materials might be in the textbook format. This has not been tested in this study but many indications resulting from this study make this recommendation appropriate.
4. That the use of programmed materials and teaching machines be considered on an individual or small group basis as well as on a classroom basis. Different programmed materials could be used at various levels for certain types of students, i. e., the more advanced students who already possess a knowledge of the basic classroom material being studied, the low ability student who needs extra help in skill building or who has missed certain basic skills at an earlier grade level, the student who has been absent and is making up work missed, and the home-bound student who will be at home disabled for a long period of time.
5. That programmed materials be considered as a device for strengthening the curriculum, especially at advance levels. For example, a class of 20 or 25 advanced math students at the high school level might be considered. Assume that five students wish to and are prepared to take calculus, five students wish and are prepared to take analytical geometry, five in statistics and so forth. A sufficient number of students are not available

to offer a class in any of these areas separately. However, through programmed materials, a combined class could be offered to accommodate all math needs. Although programmed materials are costly, this method would be less expensive than offering four or five separate classes to five students each. Perhaps it would be more beneficial to students also. This is only one example. This method could be used in several subjectmatter areas.

6. That as time permits, the following extensions of this study should be made: test students next year for retention, using some of the same spelling tests used in this study; complete an analysis of the results by sex; and determine the coefficient of correlation between intelligence and final spelling achievement. If another study of this type is designed, a test should be made to determine the "novelty effect". This could be accomplished by comparing results of first half and second half testing.
7. That a study be designed to determine if there is carry over or transfer value as indicated by the teachers. Does the use of programmed materials and teaching machines develop confidence in students? Does it provide for further independent study? Does it develop the facility for following directions?
8. That as increased use is made of programmed materials, schedule of students should be examined to control the per cent of time devoted to programmed instruction by each student. Programmed learning (or several methods of programmed learning) consists of learning which is convergent. An attempt should be made to study the effect of increased amounts of

convergent learning and decreased amounts of divergent learning.

9. That as increased use is made of programmed materials a study be made to determine ways to facilitate and take advantage of programmed learning through new techniques of scheduling and school organization.

10. That a study be made to determine which areas can best be served by programmed instruction. Are there certain basic instructional routines which can be handled better than others? Are there routines a program can develop better than the teacher?

11. That various types of research studies be continued and initiated in the local school system. Research studies which are designed and controlled appropriately tend to motivate students and teachers alike. Proposed studies should be screened. It is suggested that most proposed studies which are accepted for research will result in a great amount of professional improvement among staff members.

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APPENDIX

APPENDIX A

RELIABILITY OF SPELLING TEST

An approximation formula for the Kuder Richardson reliability[1]

$$r_{tt} = \frac{n\sigma^2_t - \overline{RW}}{(n-1)\ \sigma^2_t}$$

Where $\overline{R}$ = average number of right responses

$\overline{W}$ = average number of wrong responses

n = number of items in test

σ^2_t = square of standard deviation

M = mean

$$r_{tt} = \frac{n\sigma^2_t - M(n-M)}{(n-1)\ \sigma^2_t}$$

$$= \frac{40\,(6.36)^2 - 26.67\,(40 - 26.67)}{(40-1)\ (6.36)^2}$$

$$= \frac{1262.49}{1577.55}$$

$$= 0.800$$

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[1] Guilford, J. P., Fundamental Statistics in Psychology and Education, McGraw - Hill Book Co., Inc., New York, 1956.

APPENDIX B

PRE TESTING SCHEDULE

SPELLING EXPERIMENT - GRADES 3 & 4

Control Schools: Emerson and Lincoln

Experimental School: Cleveland

EVALUATION SCHEDULE

NAME OF INSTRUMENT	GROUP TO BE TESTED	BY WHOM	WHEN
Large Thorndike IQ (Form 2 AP)	Grade 3 only	R. Troemel	Sept. 6 & 7
Large Thorndike IQ	Grade 4 only	Classroom Teacher	7th week Regular testing program
National Achievement Tests (Spelling)	Grades 3 & 4	Classroom Teacher	Before Sept. 17
Test on Word List from Programmed Spelling Course	Grades 3 & 4	Classroom Teacher	Before Sept. 17
How I Like School	Grades 3 & 4	Classroom Teacher	Before Sept. 17
Teacher's Anecdotal Record	Grades 3 & 4 (Experimental School only)	Classroom Teacher	From Sept. 17 to completion of experiment
Students' Time Logs and Commentary	Grades 3 & 4 (Experimental School only)	Students (Cleveland only)	From Sept. 17 to completion of experiment

APPENDIX C

POST TESTING SCHEDULE

1. Test all 3rd and 4th grade children in control and experimental groups at Cleveland, Emerson and Lincoln.

2. Test the entire class (section) at Emerson and Lincoln in one group (one group for each classroom or teacher). Test during the week of March 11.

3. At Cleveland test students as they finish the program, except that small groups can be accumulated to be tested approximately every week.

4. Because of the length of the tests, each of the spelling tests should be administered in two sessions.

Tests	Items	Remarks
1. Standardized Spelling Test (National Achievement Tests)	50	Divide into two sessions
2. Spelling List of Words from Programmed Course	40	Divide into two sessions
3. Spelling List of Transfer Words	40	Divide into two sessions
4. Post Test on Programmed Course	69	One session
5. How I Like School Inventory	50	One session
Other Instruments		
6. Students' Time Logs and Commentaries		Send to Dr. O'Hare prior to June 3, 1963
7. Teacher's Anecdotal Record Booklet		Send to Dr. O'Hare prior to June 3, 1963
8. Teacher's Evaluation Sheet		Send to Dr. O'Hare prior to June 3, 1963

APPENDIX D

NATIONAL ACHIEVEMENT SPELLING TEST

Directions: Distribute an answer sheet to each pupil. Pronounce each word distinctly, at least twice. The word may be used in a sentence for an example.

Administer test in two sections, twenty five words each. Do not allow any change to be made in the first twenty five words during the administration of the second half of the test.

This test generally requires about 25 minutes. There is no time limit.

Make sure that each pupil has a sharpened pencil.

Read the directions and sample to the class, reading the sample as follows: "Good ----- Henry is a good boy ----- Good."

Use the words and sentences listed on this form. For each question, read the number of the question to the class, the word to be spelled, the complete sentence, and, finally, repeat the word to be spelled.

Pronounce words distinctly, but without unnatural emphasis that might give pupils any hint as to the correct spelling. Allow enough time for every pupil to write the word required in one sentence, before beginning to read the next question.

When the test is finished, tell the pupils to make sure their names are on their test papers, and collect the tests promptly.

APPENDIX D

NATIONAL ACHIEVEMENT SPELLING TEST

SPELLING TEST
(For Grades 3 and 4)

SCORE______

NAME____________________ Name of School__________ Grade______

AGE: Years___ Months___ GRADE___ CITY__________ STATE_____ Date_____

DIRECTIONS: BELOW, there are 50 sentences. In each sentence, one word has been left out. You will be told the word which has been left out. Listen carefully. Then, for each sentence, put the word on the line.

SAMPLE: Henry is a ___(good)___ boy.

---

1. You were ________ for school.
2. My little ________ is at home.
3. We shall ________ a good time.
4. You must ________ at once.
5. Let us ________ to another house.
6. You may ________ the book.
7. There is no ________ to drink.
8. I shall ________ a letter.
9. Let me ________ the ball.
10. He is ________ in the world.
11. There's a ________ in my stocking.
12. Have you ________ your face?
13. Tell us ________ what he said.
14. He found ________ in his work.
15. She was ________ for three days.
16. He was ________ down the street.
17. There are ________ here.
18. The bird ________ away.
19. Every ________ we rest.
20. He is a ________ man.
21. Buy some ________ at the store.
22. We could ________ the flowers.
23. She was ________ a book.
24. What is the ________ of the hat?
25. He is ________ to go home.

(GO ON TO NEXT COLUMN)

26. He is a ________ of mine.
27. Eat some ________ every day.
28. He is ________ a good boy.
29. Tell the ________ she is sick.
30. I am ________ to help you.
31. Bread is ________ to make.
32. Will you ________ the mistake?
33. Where did you ________ to sing?
34. Tell us the ________ truth.
35. Let us ________ our work.
36. He is ________ in the house.
37. I found a ________ in the city.
38. Ask the ________ to clean your teeth.
39. She is ________ years old.
40. He has an ________ in the city.
41. Give him a ________ of bread.
42. Do not ________ this paper.
43. He is ________ years old.
44. We had a ________ time.
45. Do you ________ him to go?
46. Did you ________ my letter?
47. He has no ________ to get rich.
48. I shall ________ you, if I can.
49. He gets a ________ every week.
50. I have not ________ you.

(END OF TEST. LOOK OVER WORK)

NUMBER RIGHT__________

APPENDIX E

SPELLING TEST OF SELECTED WORDS FROM PROGRAMMED SPELLING COURSE

1. consonant
2. airplane
3. set
4. not
5. bite
6. feed
7. small
8. wrote
9. store
10. base
11. there
12. cry
13. five
14. knife
15. birth
16. March
17. angry
18. eleventh
19. warm
20. funny
21. together
22. watching
23. world
24. night
25. robust
26. assist
27. fiction
28. remain
29. street
30. business
31. pretty
32. forward
33. finger
34. definition
35. bread
36. rare
37. butter
38. harvest
39. raisins
40. copper

APPENDIX F

SPELLING LIST OF SELECTED WORDS TO TEST FOR TRANSFER OF SPELLING SKILLS

1. remember
2. baseball
3. get
4. yes
5. kite
6. keep
7. light
8. writing
9. horse
10. rare
11. their
12. fly
13. nine
14. known
15. birthday
16. April
17. hungry
18. fifth
19. world
20. happy
21. remember
22. bashful
23. color
24. light
25. shallow
26. practice
27. protection
28. lightning
29. sweep
30. popular
31. rabbit
32. forget
33. lesson
34. dictionary
35. ahead
36. mule
37. letter
38. thunder
39. wealthy
40. gallon

APPENDIX G

TEST ON RULES OF SPELLING

Name____Grade__________

School________________Teacher________________________________

PRE- AND POST-TEST

1. The five vowels are: ___ ___ ___ ___ ___.
2. All the letters of the alphabet which are not vowels are: ________________.
3. The name of the letter E, as in weep, sounds like ______ e.
4. The name of the letter A, as in tape, sounds like ______ a.
5. Feed has the ______ vowel sound.
6. Meet has the ______ vowel sound.
7. Met has the ______ vowel sound.
8. Long e sounds like the name of the letter ___.
9. The long o sound is the same as the name of the letter ____.
10. Set, Feel: Which word has the short e sound? ______.
11. Rid, Ride: Which word has the short vowel sound? ______.
12. Cap, Cape: The e changes the vowel ______ from short to long.
13. An e added to words changes the vowel sound from ______ to ______.
14. Cut, Cute: Which word has the short u sound? ______.
15. Top, Close: Which word has the long o sound? ______.
16. An e added to words changes the ______ sound from short to long.
17. Tell has the ________ ______ sound.
18. Three ways to make the long e sound are:

    1. ______ 2. ______ 3. ______

APPENDIX G

19. Four ways to spell the long o sound are:

1. ______ 2. ______ 3. ______ 4. ______

20. Peel, peep, and geese are alike in that they have the ______ e ______.

21. Mine has the ________ ______ sound.

22. Three ways to spell the long i sound are:

1. ______ 2. ______ 3. ______

23. Knife has the ________ ______ sound.

24. Hat has the ________ ______ sound.

25. Bet has the ________ ______ sound.

26. Three ways to spell the long a sound are:

1. ______ 2. ______ 3. ______

27. Store has the ________ ______ sound.

28. Aid has the ________ ______ sound.

29. Jump has the ________ ______ sound.

30. Maid has the ________ ______ sound.

31. The sound shun is often spelled ________.

32. Some words have the uf sound spelled ________.

33. The u in minute has the ________ ______ sound.

34. Feel has the ________ ______ ________.

35. When q appears in a word, it is always followed by ___.

36. Too means ________________________________.

37. Two means ________________________________.

38. Long o sounds like the name of the letter ___.

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39. The k is silent in words that begin with ___.

40. The ________ ______ sound is spelled eau in the word beautiful.

41. Often the s sound is spelled ___ when it comes before ___.

42. In the dictionary, A is before B in ______________ order.

43. Ā means that the sound is _________ ______.

44. Long a sounds like the name of the letter _____.

45. To add ing to words ending in e, ___________________________________.

46. Words can be broken into parts called __________________.

47. Each syllable has a _________ sound.

48. To add ed to words ending in e, ____ _________________________.

49. Raced in the _________ ________ of Race.

50. The z sound is often spelled _____ when it comes before e.

51. The symbol "⌣" over a vowel means that the sound of the vowel is ______.

52. An _____________ is a short way of writing a word.

53. The w is _________ in words which begin with wr.

54. There are as many syllables in a word as there are ____________ ____________.

55. When the s sound comes before e, i, or y, it is often spelled _________.

56. To add ed to one-syllable words with a short vowel, __________________________.

57. In the dictionary, when words have the same letter at the beginning, they are put in the order of their ___________ letter.

58. Write the word tune and show that it has the long u sound: ________.

59. Long i sounds like the name of the letter _____.

60. The word investigate has _____ syllables.

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61. If a word has five vowel sounds, how many syllables can it be broken into? _____

62. There is usually an _____ at the end of plural words.

63. Words ending in ____, ____, ____, ____, and ____ form their plurals by adding es.

64. To form the plural of words ending in y preceded by a vowel, add _____.

65. To form the plural of words ending in y preceded by a consonant, _______________.

66. When two words are made into one by use of an apostrophe, the new word is called

a _____________.

67. When the ch sound follows a short vowel, it is often spelled ________.

68. Words which do not obey the rule stated in question 67 are: ________, ________,

________, ________, and ________.

69. When spelling a word whose sound is long e, the rule is ______________________.

APPENDIX H

Bureau of Educational Research **University of Minnesota**

The questions on this sheet ask you to tell what you like or do not like about school. Please answer them by making a circle around the YES or NO for each question. Do not stop long to think about any one question. If any one seems hard, go on to the next questions and come back to it later. There are no right or wrong answers here. The answer you mark should tell just how you feel or think about the question.

What is your name? ______________________________

Are you a boy or a girl? __________ How old are you? ______ What is your grade? _____

Name of your school ________________ Name of your teacher ________________

---

1. Is most school work interesting?
   Yes No
2. Do you feel important in school?
   Yes No
3. Do you feel you lost out if you miss school?
   Yes No
4. Do you like school?
   Yes No
5. Do you think your teacher likes the games you play?
   Yes No
6. Are you often unhappy in school?
   Yes No
7. Are you sometimes permitted to help others with their work?
   Yes No
8. When things are funny, does your teacher laugh also?
   Yes No
9. Is your teacher usually kind to you?
   Yes No
10. Is it easy for you to get help in school?
    Yes No
11. Are pupils often made to stay in for recess or after school?
    Yes No
12. Do most children in your room try to understand before [illegible]y ask questions?
    Yes No
13. Do you like school most days?
    Yes No
14. Are you praised when you do good work?
    Yes No
15. Are you scolded when you do not know something?
    Yes No
16. Is the whole class often punished when only one or two pupils are to blame?
    Yes No
17. Is your school room a happy place?
    Yes No
18. Is most school work explained so you can understand?
    Yes No
19. Are the children in your room nearly always treated fairly?
    Yes No
20. Are the children in your room allowed to ask questions?
    Yes No

(Go ahead to more questions on the other side of this sheet.)

APPENDIX H

21. Do most children in your room like to stay away from school?
    Yes No

22. Does your teacher keep her promises?
    Yes No

23. Do you like school very much?
    Yes No

24. Do you like to stay out of school?
    Yes No

25. Do you think your teacher likesyou?
    Yes No

26. Does it seem that you always do poor work?
    Yes No

27. Do you get help when you do not know something?
    Yes No

28. Do you often have too much homework?
    Yes No

29. Do you enjoy school?
    Yes No

30. Are you proud to be in your school group?
    Yes No

31. Do you like your teacher?
    Yes No

32. Are you invited to ask questions?
    Yes No

33. Do you like to talk to your teacher alone?
    Yes No

34. Are you afraid to ask questions?
    Yes No

35. Are most school days happy ones for you?
    Yes No

36. Are pupils punished in front of others?
    Yes No

37. Do you sometimes talk and joke with your teacher?
    Yes No

38. Are you often scolded in school?
    Yes No

39. Are you told when you do good work?
    Yes No

40. Do you help decide what the class does?
    Yes No

41. Are you often bossed in school?
    Yes No

42. Are your lessons explained well?
    Yes No

43. Are the children scolded often?
    Yes No

44. Are you scolded for mistakes in your work?
    Yes No

45. Is there always something wrong with your work?
    Yes No

46. Does your teacher seem to like children?
    Yes No

47. Are you afraid to ask for help?
    Yes No

48. Do you hate school?
    Yes No

49. Do most children in your room get the help they need?
    Yes No

50. Do you feel you are treated fairly in school?
    Yes No

APPENDIX I

TEACHER EVALUATION FORM

TO TEACHERS OF PROGRAMMED INSTRUCTION COURSES:

Enclosed with this material for finalizing your course in programmed instruction you will find a "Teacher Evaluation Form". It is suggested that you read it carefully and consider your answers thoroughly before filling in the form. The answers which you give will be made a part of the final research report in this experiment and will bear directly on the reported results.

Thank you,

Robert W. O'Hare
Administrative Assistant

APPENDIX I

TEACHER EVALUATION FORM

Title of Program____________________________Name of Teacher__________________

The following questions were designed to help us evaluate the program that you have just gone through with your class. The information that you can furnish will be of great value to us. For each question please check the blank that you feel most adequately describes your opinion. Blank lines have been provided below each question for you to qualify or elaborate on your answers. Please feel free to make any comments that will aid us in determining the value of this program.

Is the subject-matter of the program academically sound?

______ Yes ______ No ______ Undecided

Comments: ____

____

____

Was the level of the subject matter appropriate for your class?

______ Too difficult ______ Appropriate ______ Too easy

Comments: ____

____

____

As contrasted with what you have been able to accomplish with other types of learning material, how much do you feel you were able to get your pupils to learn with this program?

______ A great deal more than with most other materials.

______ A little more than with most other materials.

______ About as much as with other materials.

______ A little less than with most other materials.

______ So little as to be a waste of time.

Comments: ____

____

____

APPENDIX I

The next time you teach a course in this subject or a similar field, would you

_____ Prefer to have programs used for at least part of the course?

_____ Prefer not to have programs used?

_____ Not care whether programs are used or not?

Comments: ____

____

____

To what extent did you enjoy using this program with your class?

_____	_____	_____	_____	_____
Very Unenjoyable	Unenjoyable	50 - 50	Enjoyable	Very Enjoyable

Comments: ____

____

____

Do you think this program should be made available for the use of teachers throughout the country?

_____ Yes _____ No _____ Don't know

Comments: ____

____

____

In your own words would you please summarize your opinion of this program. Include statements about its strong and weak points.

APPENDIX I

TEACHER EVALUATION FORM

SIOUX FALLS PUBLIC SCHOOLS
E. W. Skarda, Superintendent

Spring, 1963

TEACHERS' EVALUATION SHEET: PROGRAMMED SPELLING COURSE

School____________________ Grade______ Teacher__________________________

Directions: Teachers at Cleveland should answer all of the following questions. Teachers at Emerson and Lincoln should answer questions number 1, 2, and 3. Please return to Dr. O'Hare before June 3, 1963.

1. Have you assigned homework in spelling to your pupils any time this year?
Yes ______ No ______.

2. If you have assigned homework in spelling, please estimate the average daily amount of time the average student would have to work to complete the assignment. (If you did not make the assignments daily please determine the amount of time per week and then divide by five to give us a daily average.

____

3. On the average, how much time (excluding one and two above) did your class devote to spelling daily? ____

4. Please give your personal evaluation of the programmed materials and teaching machines. We do not want to structure this question too highly but please consider your answer from as many viewpoints as possible. Discuss advantages and disadvantages. Would you recommend continued use of these materials? If so, under what conditions? The answer to this question is very important and we trust that you will give it your serious consideration. Add as many sheets of paper to this one as you need to complete the answer to this question.

____

____

____

____

____

____

Dr. Robert W. O'Hare

APPENDIX J

STUDENT TIME LOG

Name________________________
(last) (first)

School________________________

STUDENT DAILY TIME LOG

DATE	UNIT - COMPLETED PROBLEMS	Class Periods	Test Score
Sept. 11	I 1 - 60	1	
Sept. 12	I 61 -100	1	
Sept. 13	I 101 - 143	1/2	
	Unit I Test	1/2	12 out of 20
Sept. 14	II 1 - 35	1	
Sept. 17	Absent	0	
Sept. 18	No class (assembly	0	
Sept. 19	II 36 - 85	1	

Example

APPENDIX K

STUDENT EVALUATION FORM

1. If spelling machines had not been used in spelling class, I believe:

   ____ I would have learned less in spelling.

   ____ It would have made no difference.

   ____ I would have learned more in spelling.

2. In comparing work done using the spelling machines with studying in the textbook, I feel that, with the same amount of time and effort:

   ____ I learn much more with the machines.

   ____ I learn somewhat more with the machines.

   ____ I feel there is no difference.

   ____ I learn somewhat more from studying textbooks.

   ____ I learn much more from studying textbooks.

3. If I were to take another course in this subject or a similar subject, I would:

   ____ choose to have machines used for at least part of the course.

   ____ choose not to have machines used.

   ____ not care whether machines are used or not.

4. How much do you think you learned from using the spelling machines?

____	____	____	____	____
Learned nothing	Learned a little	Learned a medium amount	Learned quite a bit	Learned very much

5. How much did you enjoy going through this program using the spelling machines?

____	____	____	____	____
Very much disliked	Disliked	Don't know	Enjoyable	Very enjoyable

6. In your own words say what you thought of the spelling machines. For example, what did you like about the program? What didn't you like about it, etc.?

APPENDIX L

WORD LIST FROM PROGRAMMED MATERIALS

vowel
bridge
cross
road
across
letter
every
afraid
again
consonant
alphabet
brave
front
head
ahead
before
very
needs
plane
airplane
wings
fly
tube
hid
hurry
quickly
changes
Christmas
December
train
rip
bite
mule
close
week
each
led
yes
opposite
desk
number
feed
three
between
store
yet
seven
fish
animal
broke
sit
brake
tiny
store
pieces
stop
signal
spring
begin
grow
cry
ring
ball
base
baseball
team
Sunday
sun
globe
round
please
season
core
apple
middle
five
trapper
trap
wild
dam
jet
powered
them
here
winter
knife
cutting
March
April
September
October
frozen
more
hungry
feet
begin
angry
rabbit
hatch
tune
happy
yesterday
Friday
Saturday
May
huge
November
eleventh
fried
hide

APPENDIX L

long
short
lined
under
smoke
protection
chimney
flag
blue
keep
camper
watching
circus
built
popcorn
lawn
met
long
lunch
earth
wait
world
four

drop
lake
far
near
lesson
tough
frame
picture
wealthy
help
thunder
assist
clay
people
indians
pound
purple
bowls
twelve
January
color
fiction
imaginary

play
players
month
year
popular
were
milk
pharmacy
photograph
forget
remember
business
climb
ladder
school
double
toes
enemy
foe
near
made
pretty
price

June
space
funny
February
guide
bright
turns
which
horse
colt
young
definition
difficult
question
answer
equal
quart
divide
multiply
quarter
evening
bread
bashful

August
sight
July
busy
smile
wrote
surprise
attack
pleasant
skate
hammer
harvest
abbreviation
dictionary
success
dance
column
author
autumn
population
practice
raisins
excellent

APPENDIX L

east
direction
correction
error
plain
under
understood
morning
underlined
feed
sweep
set
met
ride
rid
mat
except
day
Wednesday
Tuesday
tomorrow
name

twelve
hour
minute
sixth
ninety
seventy
valley
canyon
heavy
light
large
small
protection
water
tooth
brush
clean
cleaning
teeth
pop
night
incorrect

thing
clothing
shine
bushel
peck
Washington
president
capital
time
clock
their
there
snow
ground
child
children
fire
dress
weep
seek
hunt
carrot

shy
smooth
beautiful
coin
camera
roof
salute
known
napping
days
cakes
birth
birthday
kill
insects
fix
man
pair
repairman
television
vision
purchase

eagle
umbrella
ounce
surface
plural
solitude
precede
diamond
summer
hold
syllable
warm
mail
ice
office
rain
dark
clouds
sky
laughed
clown
straight

APPENDIX L

town
hundred
red
dollar
white
American
swim
guards
together
group
chance
remain

wrong
uncle
ants
aunt
lightning
enough
rough
strong
robust
fifth
arithmetic
forward

vegetable
beets
tables
early
telephone
talk
often
mountain
street
listen
person
rare

door
house
float
boat
about
journey
brook
stream
finger
soft
wheel
copper

shallow
buffalo
quite
scarce
ocean
comb
breakfast
circle
butter
pronounce
gallon
night

APPENDIX M

LETTER TO PARENTS AND INFORMATION ON TEACHING MACHINES AND PROGRAMMED INSTRUCTION

CLEVELAND SCHOOL

September 27, 1962

Dear Parents:

The purpose of this letter is to inform parents that their child will be studying spelling this year in a somewhat different manner than in previous years.

Attached to this letter is a bulletin discussing teaching machines and programmed learning. It has been prepared by The Center for Programmed Instruction Inc., in New York City.

Your child is in a class in which programmed materials and teaching machines will be used during the coming school year. The purpose of the attached bulletin is to give you an understanding of programmed materials and teaching machines.

The programmed materials and teaching machines will be used approximately twenty (20) minutes per day for the instruction of spelling. Students will be tested at regular intervals to assure that the material is being learned in an effective manner.

If you should have any questions regarding this special instruction, please feel free to contact your child's classroom teacher, Dr. O'Hare in the Superintendent's Office, or myself.

The above mentioned program pertains to the rooms of which Mrs. Bryant, Mrs. Gunderson, Mrs. Hegstrum and Mrs. Mayforth are the teachers.

Sincerely,

H. L. Svendsen, Principal

APPENDIX M

LETTER TO PARENTS AND INFORMATION ON TEACHING MACHINES AND PROGRAMMED INSTRUCTION

A PARENTS GUIDE TO TEACHING MACHINES AND PROGRAMED INSTRUCTION

Prepared and Published by The
Information Division of
THE CENTER FOR PROGRAMED INSTRUCTION, INC.

Purpose of the pamphlet:

This pamphlet is intended to help parents interested in utilizing teaching machines and/or programed instructional materials to further their children's education. Most parents have read about teaching machines and programs in magazines or newspapers. The effect of instruction by means of these devices is often impressive, and parents are interested in their possibilities for home study. In addition, many programs and teaching machines are being "offered for sale" in supermarkets, by door to door salesmen, and elsewhere by direct mail, newspaper and magazine advertising. The huge number of requests for information and advice received by the Center indicates that many parents are interested in using these materials and would like guidance as to which programs would be appropriate and for what purposes. It is hoped that this pamphlet will help solve some of the problems which you, the parent, will face.

What is a "program" of instruction?

A "program", as a glossary term for a specialized means of instruction, is a sequence of carefully constructed items or frames leading the student to mastery of a subject with a minimal error. Information is given to the student in small units to which he responds in some way--by completing a sentence, working a problem, or answering a question, and at each step he receives immediate confirmation of his response. Items are designed so that the student can make correct responses while progressing toward more and more complex material and ultimately building the conceptual framework of a subject area. The principles of programing come to us from basic psychological research dealing with the learning process. The "program" should be thought of as a more efficient and effective book, always enhanced by the implementation of a good teacher--and not another "plan" or audio-visual "gimmick."

Is A Teaching Machine Necessary?

A teaching machine has been likened to the binding of a book. Therefore, if a child learns anything, he will learn as a result of the material in a teaching machine (i. e. the program) rather than a result of the teaching machine itself. The machine in actuality has very little to do with the process, and is in many cases unnecessary. Most programs

APPENDIX M

which can be presented by teaching machines can also be presented in a special type of book. Over 90% of the programs presently available for use are published as programed textbooks.

The evidence compiled to date seems to indicate that there is essentially no difference in the learning that takes place between the presentation of a program in a teaching machine and its presentation in a programed textbook. Seven independent research studies have shown no differences between those two methods of presenting a program. Hence, the important thing to get for the child is the program and not necessarily the teaching machine. An up-to-date compendium, with pictures, of available teaching machines may be found in the Finn-Perrin, Teaching Machines and Programed Learning, 1962: A Survey of the Industry. This publication is available from the National Education Association, Washington, D. C.

The Effectiveness of Programed Instruction:

Several experiments using programs have reported very impressive results. There is no doubt that many students can learn a great deal independently with good programs. Unfortunately, not all programs are of equal quality, and there are programs in existence which have not been able to teach anybody anything. It is also unfortunate that several of the producers of teaching machines and programs have resorted to deceptive, sensational advertising. In some cases, advertisements have described very effective, impressive results obtained with a program, and this is accurate, but the situation which produced these results was one which did not even utilize the programs or teaching machines which are being offered by the advertisement.

Thus some producers are giving the impression that it was their material which produced these results when in point of fact it may have been the material of another company. In some instances, producers have gone so far as to inaccurately or incompletely report the effect of a program, and as a result make it look much better than it is.

Even if one has a good quality program, this does not necessarily mean that all children will learn from it. There are, unfortunately, some children who have difficulty learning in school. In addition, most of the programs available today require the student to read. Children who have serious reading difficulties probably will not even be able to read through the program. Programed instruction does not promise miracles, contrary to what some producers seem to be claiming. In general, we have found that success on a program is highly correlated with school success and intelligence. This means that children who do well in school will tend to learn more from a program than students who are not doing as well. Programs can help, in many cases a great deal, but education of a child is a complicated process involving hundreds of problems, and programed instruction like anything else cannot solve all of these in one moment.

Use of Programed Instruction:

Programed instruction is being used by many schools throughout the country to help in the extremely important job of educating our children. Research evidence so far shows that

APPENDIX M

children can learn from programs just as effectively at home in an "unsupervised situation" as they can at school. Naturally, programs do not teach all of the things that are important for our children to learn, and a great deal of school time is required for this, but the experimental evidence gathered to date on the use of programs in the home is very encouraging. It seems feasible and sensible to enrich a child's education through experience with programs at home. In some cases programs may be used with the intention of helping a boy or girl who is slightly behind in his work to "catch up." In other cases, programs may be used with youngsters who are doing well in school to help further their education.

The Availability of Programs:

Programs are available from many sources. The most common sources that the parent would come into contact with would be the door to door salesman, the supermarket, and periodical and newspaper advertising. Many, if not most of the programs which are being used in schools are available through the typical producers of instructional materials. In general, these organizations do not place newspaper advertising, market their products through supermarkets, or have a force of door to door salesmen.

Do not necessarily purchase the first program or machine which is offered to you. Programs vary in quality, some being very good and others being extremely poor. One must exercise as much care in the purchasing of programs as one would in the purchasing of food in a supermarket. While some foods are very palatable, others are only digestible, and some will cause trouble. There are several steps we would recommend before purchasing a program or a teaching machine.

Suggested Steps for Parents:

If a salesman has approached you with respect to buying a particular program, or you are interested in a program because you have seen it in a bookstore or supermarket or read an advertisement, we would suggest that you write down the name of the program and the publisher and take it along with this leaflet to your child's teacher or guidance counselor. The professional school personnel can look up the program in Programs '62: A Guide to Programed Instructional Materials published by the U. S. Office of Education and check to see whether or not the program you are considering teaches material similar to what your child is learning in school. In the United States each school system determines to a great extent its own curriculum. Not all school systems teach the same thing and the approaches to different subjects may vary considerably from school to school. It is extremely important that the content and approach of the program you are considering are consistent with the objectives of the school that your child attends.

Two contradictory approaches (one in school and the other at home with a program) can confuse your child, and, rather than help him, you may hinder his efforts. For example, a science program for the fifth grade may teach all about the human body. The school, on the other hand, might be teaching their fifth graders all about atomic structure and both might have the labels of "fifth-grade science." Your child's teacher or guidance counselor

APPENDIX M

is in the best position to know whether or not the particular program you are interested in may help your youngster, for they know the objectives of the school.

If you are interested in using programs of instruction for your children, but have not seen any programs in particular, consult the school personnel and ask them to look in the Guide to Programed Instructional Materials and recommend a program which teaches the kind of thing that would be helpful for your child. Then you may obtain the program from the publisher directly.

There is always the possibility at this time that there is no program for your child's grade level in a particular subject. More programs are being written every day, and hopefully, one will soon become available. A program of high quality, which is consistent with the approach and content which your child is learning in school, can make a valuable contribution to his education for the challenging years which lie ahead.

Questions to ask:

1. What does this program teach?
2. How do I use it?
3. How long should my child work at one time?
4. Should he enlist outside help?
5. How do I know what he is learning or how well he is doing?

The Center for Programed Instruction, Inc., a non-profit, educational organization, was established in December of 1960, with the help of a grant from the Carnegie Corporation of New York. It is dedicated to the research and development of the principles of programing as well as the collection and dissemination of information concerning the utilization of programed instructional materials. The major objective of the Center is to translate research findings into practical classroom application, primarily at the elementary and secondary levels.

APPENDIX N

INFORMATION RELATIVE TO TEACHERS' PARTICIPATION IN EXPERIMENTAL GROUP

SPELLING - PROGRAMMED LEARNING AND TEACHING MACHINES

I. Motivation

A. Positive -- which type? (more able, low intelligence, personality type? works on own initiative or needs to be encouraged)

B. Negative -- which type? (more able, low intelligence, personality type?)

II. Behavioral characteristics

A. Calm and relaxed or nervous and anxious (How does reaction here compare with regular reaction?)
B. Persistent or gives up easily
C. Sincere or racing through just to finish
D. Depressed
E. Cooperative or negative-fearful
F. Overactive or underactive
G. Attention
   1. Concentrated, absorbed by the task
   2. Normal attention to outside distractions and returns to task
   3. Easily distracted
   4. Day-dreams
   5. Difficult to hold attention for more than a few seconds

III. Causes of errors

A. Lack of phonetic sense
B. Poor visualization
C. Faulty enunciation and pronunciation
D. Inability to apply word-attack principles such as
   1. syllabication
   2. final e
   3. double vowels
E. Careless handwriting
F. Intelligence
G. Faulty study procedure
H. Low reading ability
I. Handwriting

APPENDIX N

IV. Evidence of progress in spelling

   A. Use of dictionary for spelling
   B. Carryover into other composition
   C. Proofreading practiced
   D. Effective study habits

V. Actual comments made by pupils

APPENDIX O

INSTRUCTIONS TO STUDENTS REGARDING THE USE OF PROGRAMMED MATERIALS AND TEACHING MACHINES

1. Avoid bending corners or folding program sheet.

2. Before inserting unit into machine double check to be sure pages are in proper order.

3. Insert only one unit at a time.

4. Remember to turn unit over after finishing the front side.

5. Keep check on frame numbers so that two sheets don't creep through.

6. Be sure the last sheet is completely through the machine before inserting new unit.

7. Close top before removing a unit from machine. The top will have to be lifted slightly to let the sheets come out. (With the top open the hinges may rip loose.)

8. Use both hands when opening and closing top.

9. Be careful about turning too far and overshooting frame. You can't back it up!

10. At the beginning of the period take five minutes or so to review what you covered the day before.

11. Be careful about speeding too fast!! Think about what you are learning.

12. REMEMBER YOU ARE NOT COMPETING WITH YOUR NEIGHBOR. DON'T TRY TO KEEP UP WITH HIM -- KEEP UP WITH YOURSELF.

DON'T FORGET TO MAKE OUT THE STUDENT'S DAILY LOG !!!

(Leave the log sheet in your machine when you leave.)

APPENDIX P

MATERIALS DEVELOPED BY TEACHERS AND CONSULTANTS FOR USE IN GROUP A

Lesson I

led
sit
rid
hid

near
road
deeds
sun

boat
week
train
jet

Monday
Tuesday
Wednesday
Thursday

pieces
autumn
Friday
Saturday
Sunday

Child choice for extra words.

Lesson II

yes
red
mule
bite

yet
desk
close
multiply

set
brave
hide
Indians

pick
plane
September
raisins

met
tube
August
beautiful
which

Child choice for extra words.

Lesson III

mat
camp
skate
trapper

trap
dance
frame
camper

apple
play
wait
player

dam
clay
mail
straight

flag
day
rain
American

Lesson IV

Review the words most difficult for children

cross
pop

across
breakfast

long
carrot

drop
vegetable

clock
butter
buffalo

Lesson V

base
huge
smile
ice
baseball

space
frame
guide
cakes

brake
shine
ride
rare

broke
price
name
scarce

lake
made
white
ball

Activity: Build compound words from spelling list example: spaceman

APPENDIX P

Lesson VI

seek
feet
excellent
copper
sweep
keep
gallon
letter
beets
teeth
cutting
man
feed
weep
happy
pail
wheel
dollar
funny
repairman
pheasant

Lesson VII

clown
known
about
hour
rough
town
tomorrow
house
ounce
tough
vowel
snow
pound
pronounce
powered
shallow
round
clouds
bowls
grow
ground
enough

Lesson VIII

seven
month
milk
soft
fish
them
kill
October
spring
winter
fix
sixty
ring
hatch
lunch
ninety
thing
long
help
seventy
salute

Lesson IX

again
team
east
straight
before
please
plain
fire
globe
season
diamond
shy
each
here
clean
colt
between
smoke
cleaning

Review days of the week.

Lesson X

hurry
attack
lesson
under
November
middle
umbrella
summer
underlined
hunt
ladder
dollar
error
understood
time
hammer
incorrect
assist
September
dress
excellent
success
difficult
October

Lesson XI

care
morning
ice
heavy
store
short
fifth
built
horse
fly
eleventh
earth
door
far
author
world
more
May
pharmacy
there
were

APPENDIX P

Lesson XII

fried
chimney
ants
turns

laughed
valley
days
toes

lined
rabbit
cakes
insects

napping
animal
tables
guards

watching
Aunt
wings
houses

Lesson XIII

people
bread
year
blue

purple
head
tune
sky

eagle
ahead
tiny
four

uncle
very
syllable
twelve

circle
cry
busy
three
five

Lesson XIV

tooth
strong
pretty
sight

brush
child
float
light

comb
children
stream
night

water
finger
Christmas
bright

robust
vision
December
straight

Lesson XV

mountain
solitude
lightning
warm

canyon
smooth
bridge
ocean

lawn
brook
January
begin

thunder
small
swim

surface
large
journey

Lesson XVI

often
imaginary
rare

dark
bashful
quite

wrong
young
May
October

early
popular
August
November

quickly
wealthy
September
December

Review months of year – learn to date
Review – Days of week

Lesson XVII

arithmetic
peck
equal
group

minute
bushel
divide
consonant

hundred
coin
ounce
alphabet

quarter
purchase
column

quart
answer
number

APPENDIX P

Lesson XVIII

April
June
July
every
March
February
January
afraid
front
birth
airplane
angry
opposite
birthday
photograph
hungry
frozen
forget
business

Lesson XIX

direction
abbreviation
forget
correction
dictionary
popcorn
definition
television
talk
question
protection
color
population
fiction
except
hold

Lesson XX

remain
together
street
chance
telephone
picture
listen
roof
forward
camera
person
surprise
yesterday
their
circus
practice
precede
office
wrote

APPENDIX P

170 EXTRA-HARD WORDS FOR GRADE FOUR SPELLERS

knocked
polar
noticed
elected
public
cabbage
there's
violin
question
famous
quietly
acres
costumes
addition
national
tobacco
squirrels
neighbor
slipped
million
February
automobile
furniture
easily
speech
auntie
carnival
shepherds
celebrate
manufacturing
electricity
certainly
operetta
principal

husband
giant
American
remembered
garage
gotten
slippers
pupil
conquest
mother's
daughter
distance
grocery
receive
climate
subjects
neighbors
you're
practice
certain
honor
believed
period
planned
accident
fairies
museum
scene
grabbed
citizen
position
articles
experience
appreciate

fields
forgotten
Negro
population
subject
dropped
grandmothers
canary
divided
beginning
common
castle
planning
general
themselves
dangerous
bananas
studied
valentines
canoe
autumn
pilgrims
whistle
science
capital
colonies
prettiest
material
college
terrible
imagine
characters
orchestra
especially

holiday
traveling
hurried
moss
cousins
sentence
exciting
eighth
recess
cellar
studies
surface
modern
reindeer
flies
slaves
decorated
allowed
possible
handkerchief
region
industry
buried
aunt's
special
separate
skies
citizens
skiing
probably
secretary
constitution
necessary
foreign

sweater
lovingly
piano
one's
promised
couple
journey
treasure
choose
balloon
safety
junior
holidays
central
products
germs
rifle
neither
secret
pleasant
sentences
lettuce
whether
stepped
factories
attention
system
typewriter
handkerchiefs
stomach
assembly
disease
auditorium
association

APPENDIX Q

MATERIAL RECEIVED BY ALL SCHOOLS

SPELLING

Grades Four, Five, and Six

I. General principles to follow in teaching spelling

A. The most justifiable criterion for the selection of words for spelling instruction is their use in writing.

B. Words used in their functional writing have meaning for children.

C. The importance of relating spelling to meaningful writing does not diminish when more systematic instruction is undertaken.

D. For most groups of children, expecially intermediate, the test-study-test plan of instruction proves best.

E. What is done in the period of study is, of course, most important. Study that involves the sound, appearance, meaning, and use of words is necessary.

F. It is as logical to group children for learning to spell as it is for learning to read because spelling abilities are so clearly distinguishable. The class as a whole deals only with matters of common concern.

G. Understanding syllabication helps children see the parts of words. This aids in pronouncing and remembering words. Children should learn to recognize syllables as parts of entire words rather than as separate elements.

H. The spelling list being used must be within the learner's ability to master.

I. Build a "spelling conscience".

J. Require correct spelling in a finished product.

K. Whenever possible correct errors as the child works rather than after a period of time.

L. Proofreading is essential.

M. The middle-grade child develops the tools he needs in perfecting spelling skills such as a basic method for learning to spell each individual word (spelling power), plus the dictionary skills that will aid him in checking for correctness. At this stage the teacher gives a considerable amount of guidance.

APPENDIX Q

N. A folder that contains evidence of the amount of progress is advantageous. Such evidence includes first drafts and finished pieces of writing related to school activities, separate lists of words that he can spell without any help, others on which he is working, and still others that interest him to such an extent that he would like to make them part of his spelling vocabulary.

O. Research shows that it is the easy words the intermediate grade pupils misspell -- the three kinds of there and the three kinds of to.

P. Careless and poor handwriting are the most frequent causes of mistakes in spelling.

II. Word attack or study techniques for learning to spell a new word (James Fitzgerald)

A. Approach
   1. Pronunciation
   2. Meaning
   3. Use

B. Active learning of spelling
   1. Imagery through visual scrutiny
   2. Recall
   3. Writing the word
   4. Mastery of the spelling of the word

C. Use of the word

III. Guide questions for evaluation (Ethel Hatchell and Donald Hughes)

A. Does the child spell commonly used words correctly in his written work?

B. Does he keep a list of words he misspells?

C. Can he study independently?

D. Can he apply simple generalizations?

E. Does he use the dictionary frequently?

IV. Spelling rules

A. Rules should always be developed inductively.
After a rule has been developed it needs to be reviewed and applied regularly.

B. Only rules which apply to a large number of cases and have few exceptions need to be taught.

C. Teach those rules given in the teacher's edition of the spelling textbook.

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V. Development of independence or self-dependence

A. Have the child keep a list of his own misspelled words and learn to spell those words -- a composite record of all Friday's tests will show progress. Pairs of children may work together once a week to check each other on these individual lists.

B. Form the habit of consulting a dictionary for correct spelling.

C. Help a child to diagnose his own needs.

D. Teach understanding of derived forms.

E. Build for "spelling conscience" -- word mastery requires continued use and practice.

VI. Interest in spelling

A. Have varied, spirited, expeditions work in the spelling period.

B. Lead pupils to appreciate the fact that spelling errors make a poor impression in letters and other written work.

C. Satisfy the need to achieve through definite evidence that each child is making progress. Let children cooperate in setting their goals.

D. Dr. Ernest Horn says "Mutual helpfulness is better than competition. Games, contests, devices, and working for school marks, if used at all, should be thought of as supplementing the more intrinsic appeals listed above rather than as substituting for them".

E. Give the pre-test -- Have each child check his own making corrections carefully -- Without further study, pronounce list again -- Let child see improvement he made through careful correction.

F. Dramatize or act out words to be spelled.

G. Games help create interest in spelling -- Here are a few you may wish to use:

1. Racing Game--
One child writes a word on the blackboard beginning with a silent letter, as knife. Other children then see how many words they can write beginning with the same silent letter, as know, knot, knead, knight, etc.

2. Word Pyramid --
Start at the top of the pyramid with the word a. The players take turns adding another letter to form a new and longer word and to build the

APPENDIX Q

pyramid. If the first player adds t, the pyramid may develop as follows: a, at, eat, meat, or team, steam, stream. Plurals do not count. For example, adding s to meat is wrong, but using "s" to form the new word steam is right. The pyramid may be built on the blackboard or on the table with alphabet blocks.

3. Puzzles--
   Block out a puzzle, placing the initial letter of desired words at the top of the vertical columns. A list of meanings provides added clues. No attempt need be made to build words horizontally. One can build words horizontally and not vertically.

4. Word Authors--
   This game is played like the old game of "Authors". A "book" is completed when a child holds four variations of a word, as: walk, walks, walked, walking. Whoever holds most "books" is the winner. Prefixes can be used as well as suffixes.

5. Word Hunt--
   Have children see how many short words they can find and write in a given length of time from a long word appearing on the blackboard. Credit is given for only correctly spelled words.

6. Baseball Games--
   Let two captains choose sides, making sure that all children are on a team. Pronounce three words, one at a time, for the first "batter" to spell. If he spells all three words correctly, he takes his position in a corner of the room designated as "first base." Second batter is then up and the same procedure followed. First batter steps to second base, present batter to first base. The same proceeds until all bases are filled, etc. Words could be written on board rather than spelled orally.

7. Treasure Box--
   Words are written on separate slips of paper which are then folded and put into a box called the "treasure box." Each child in turn draws out a slip and hands it to the teacher without opening it. The teacher pronounces the word for the child to spell. If he misspells the word, the slip is returned to him. Whoever ends with no slips is winner.

8. Vowel and Consonant Games
   a. Have pupils write sentences in which the initial consonant in every word is the same. Betty buys big blue balloons.
   b. Direct pupils to make new words by changing the vowel in such a word But to make the words, bat, bet, and bit.

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c. Divide the class into two groups. Have one group make new words by prefixing a consonant, such as prefixing b, c, f, etc., to all, and the other group make new words by subtracting initial consonants from words such as year and train to make ear and rain.

d. Introduce a puzzle element, by saying:
"I am in Toy, Top and Tree. What sound am I?"
"I am in Took, but I am not in Look."
Look, like, and little begin with me.
Stand, friend, and good all end with me.

9. Endless Chain--
A player starts this game by spelling any word that he wishes. The next player spells a word that begins with the first letter of the word spelled by the first player.

The Improvement of Spelling
Madison Public Schools
Curriculum Department
Madison, Wisconsin

10. A Word Game--
All the players form a circle and a large rubber ball is tossed around the circle. Each person receiving the ball must call out a word ending with a given sound.

11. Have child give a sentence containing a word from a given list but not say the given word. The class determines the word from context and writes it.

H. Exercises which will give additional practice in spelling:
1. Writing a story (original) using as many of the day's words as they can
2. Making up riddles about some of the day's words
3. Using some of the day's words to write jingles
4. Working with some of the slow spellers on the day's words
5. Working out charades to illustrate one of the day's words
6. Making a picture dictionary for slow learners
7. Working together in groups of two to see how accurately they can spell words which they hear but do not see
8. Making a list of as many rhyming words as possible for each word in the day's work, as:

hurry
flurry
scurry
furry

since
mince
convince

September
November
December
remember

9. Keeping a list of new words they see or hear used in life outside the classroom

---Research Department Report, Webster Publishing Co.

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VII. Factors which are most frequently associated with low achievement:

A. Low reading ability
B. Defective speech
C. Slow or illegible handwriting
D. Disabling traits of personality
E. Low intelligence
F. "Many children are poor spellers because of one or more of the following: (1) They are not interested in spelling. (2) The right words have not been presented to them. (3) Time has been wasted by them in studying words they did not need or words they already knew how to spell. (4) A well-planned spelling program has not been inaugurated. If a child studies the words he cannot spell when he needs them in his writing, by a method which provides efficient ways of learning and which informs him of success when he has mastered a word, he will most generally succeed in learning to spell."

--James A. Fitzgerald, Professor of Education at Fordham University, Child and the Language Arts

VIII. The one hundred most frequently misspelled words in grades 2-6:

all right
were
the
right
like
getting
birthday
would
they
sometime
Mrs.
Halloween
don't
down
every
everybody
February
I'm
it
it's

fine
am
and
their
Santa Claus
likes
goes
Christmas
write
time
sometimes
my
have
haven't
he
here
him
how
I
I'll

January
for
when
will
them
Saturday
me
going
coming
writing
to
stationery
name
now
o'clock
October
on
one
our
play

pretty
know
friend
are
with
then
school
morning
good-by
cousin
you
today
summer
Sunday
suppose
sure
swimming
teacher
teacher's
Thanksgiving

that's
received
letter
from
because
won't
there
some
mother
guess
didn't
your
tonight
too
two
very
want
was
we
went

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MATERIALS RECEIVED BY ALL SCHOOLS

THE MASTER DEMON LIST OF 222 WORDS
A Useful Core Vocabulary For Child Writing

James A. Fitzgerald, "A Crucial Core Vocabulary In
Elementary School Language and Spelling."
American School Board Journal, Vol. 103, July, 1941, pp. 22-24

---

about
address
afternoon
again
all right
along
already
always
am
an
and
answer
anything
anyway
April
are
arithmetic
aunt
awhile
baby
balloon
basketball
because
been
before
birthday
bought
boy
boys
brother
brought
can
cannot
can't
children
Christmas

dog
don't
down
Easter
every
everybody
father
Feb.
fine
first
football
for
fourth
Friday
friend
friends
from
fun
getting
goes
going
good
good-by
got
grade
guest
had
Halloween
handkerchiefs
has
have
haven't
having
he
hear
hello

how's
I
I'll
I'm
in
isn't
it
it's
I've
Jan.
just
know
lessons
letter
like
likes
little
lots
loving
made
make
Mar.
maybe
me
Miss
morning
mother
Mr.
Mrs.
much
my
name
nice
Nov.
now
nowadays

party
people
play
played
plays
please
pretty
quit
quite
receive
received
remember
right
said
Santa Claus
Saturday
saw
school
schoolhouse
send
sent
sincerely
snow
snowman
some
something
sometime
sometimes
soon
stationery
store
studying
summer
Sunday
suppose
sure

then
there
there's
they
they're
think
thought
through
time
to
today
together
tomorrow
tonight
too
toys
train
truly
two
until
vacation
very
want
was
we
weather
well
went
were
we're
when
white
will
with
won't
would

APPENDIX Q

close
come
coming
couldn't
cousin
daddy
day
Dec.
didn't
her
here
him
his
home
hope
hospital
house
how
o'clock
Oct.
off
on
once
one
our
out
outside
surely
swimming
teacher
teacher's
Thanksgiving
that's
the
their
them
write
writing
you
your
you're
yours

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A CORE VOCABULARY OF SPELLING WORDS

By George Kyte and Virginia Neel

Elementary School Journal, 54:32-33, September, 1953

Type I. 315 Words Occurring In Identical Form Among 500 Most Commonly Used Words In Adults' and In Children's Writing.

---

a
about
after
afternoon
again
ago
all
almost
along
also
always
am
an
and
another
answer
any
anything
are
around
as
ask
asked
at
away
back
bad
be
because
bed
been
before
being
best
better
big
book
books
both
box
boy

call
called
came
can
can't
car
care
city
class
close
cold
come
coming
could
country
cut
day
days
dear
did
didn't
different
dinner
do
does
doing
done
don't
down
each
early
end
enough
ever
every
far
few
find
fine
first
five

from
full
gave
get
getting
girl
give
glad
go
going
gone
good
got
great
guess
had
half
hand
happy
hard
had
have
having
he
hear
heard
help
her
here
high
him
his
home
hope
house
how
I
if
in
into
is

kind
knew
know
large
last
later
left
let
letter
life
like
little
long
look
looking
lot
love
made
make
making
man
many
may
me
men
might
money
more
morning
most
mother
Mr.
Mrs.
much
must
my
name
near
never
new
next

now
of
off
old
on
once
one
only
open
or
other
our
out
over
paper
part
party
people
place
play
please
pretty
put
quite
read
ready
received
rest
right
room
run
said
same
Saturday
saw
say
school
second
see
send
sent

APPENDIX Q

bring
but
buy
by
since
until
something
used
such
was
tell
well
the
where
these
will
this
world
time
year
too
you
for
found
four
friend
two
so
us
stay
wanted
sure
week
thank
what
then
who
things
with
three
writing
together
yesterday
truly
it
its
just
keep
six
up
soon
very
summer
way
ten
went
their
which
they
winter
those
would
to
years
took
your
nice
night
no
not
under
some
use
still
war
take
weeks
that
when
there
why
think
work
through
wrote
told
yet
try
set
she
should
show
small
upon
sorry
want
Sunday
we
than
were
them
while
thing
wish
thought
write
today
yes
town
yours

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Leslie W. Johnson, "One Hundred Words Most Often Misspelled
By Children In The Elementary Grades."
Journal Of Educational Research 44:154-5, October, 1950
(Study of creative writings of 14,643 children)

---

their
believe
from
different
until
started
like
than
mother
received
came
when
getting
thought
knew
an
you're
where
didn't
babies
running
hear
every
then
it's
once
were
through
heard
named
friend
bought
because
many
children
animals
went
happened
dropped
pretty
wanted
caught
they
him
February
first
off
again
something
decided
some
said
here
friends
woman
it's
together
around
people
morning
before
there
things
for
swimming
asked
would
cousin
know
threw
to
tried
sometimes
course
beautiful
all right
jumped
looked
very
surprise
too
little
frightened
interesting
our
that's
they're
two
another
coming
name
let's
going
and
with
school
clothes
stopped
always
money

APPENDIX Q

First 100 Words in Order of Frequency

from

A Basic Writing Vocabulary - 10,000
Words Most Commonly Used in Writing

I
now
one
you
see
been
it
no
when
will
please
some
at
make
good
if
send
day
very
made
our
and
an
he
in
what
can
is
did
they
are
his
or
with
received
just
so
work
out
had
yours
am
a
them
do
for
were
she
have
say
which
as
over
us
on
two
up
was
dear
order
the
well
time
of
go
letter
that
how
about
be
him
has
this
may
know
all
after
much
my
glad
from
to
here
get
we
come
would
your
think
any
not
got
there
but
before
by
me
could
her
like

APPENDIX Q

150 EXTRA-HARD WORDS FOR GRADE THREE SPELLERS

---

program
surprised
kitchen
building
beautiful
electric
hungry
station
interesting
awhile
important
fifth
passed
we're
quickly
fourth
minute
parents
stockings
squirrel
trouble
laughing
several
post office
excuse
frightened
wouldn't
travel
sleigh
taught

women
office
telephone
heavy
colored
either
surprise
health
suppose
Halloween
we'll
written
elephant
running
against
carried
enjoyed
minutes
known
radio
countries
babies
piece
education
potatoes
answer
vegetables
really
stories
bicycle

thousand
scared
build
bridge
discovered
lessons
business
happened
board
southern
colors
skating
believe
all right
group
supposed
surely
desert
cities
hadn't
oranges
hospital
laughed
Indian
favorite
settled
whole
sincerely
policeman
buildings

pencil
different
instead
chickens
though
truly
history
teacher's
company
climbed
president
circus
flew
ghost
remember
field
awful
language
sliding
suddenly
sudden
that's
course
valentine
else
finally
fought
sugar
usually
pieces

tomorrow
death
threw
enough
months
mountain
answered
beads
doesn't
listen
thirty
decided
village
let's
library
studying
doctor
straight
chief
pupils
geography
finished
interested
soldiers
married
breakfast
arrived
toward
raise
government

The above list from American English Book 3 by Burrows, Stauffer and Jackson.

APPENDIX Q

170 EXTRA-HARD WORDS FOR

GRADE FOUR SPELLERS

---

knocked
daughter
autumn
secretary
polar
distance
pilgrims
constitution
noticed
American
Negro
hurried
elected
receive
science
foreign
public
accident
flies
cabbage
fairies
slaves
there's
museum
decorated
violin
scene
allowed
question
grabbed
possible
famous
citizen
handkerchief

quietly
honor
imagine
sweater
acres
believed
characters
lovingly
costumes
grocery
planning
piano
addition
planned
especially
one's
national
subject
special
tobacco
dropped
separate
squirrels
grandmothers
skies
neighbor
canary
citizens
slipped
divided
skiing
million
beginning
probably

February
position
holiday
safety
automobile
articles
traveling
junior
furniture
period
whistle
holidays
easily
appreciate
mass
central
speech
themselves
promised
auntie
dangerous
couple
carnival
bananas
journey
shepherds
studied
treasure
celebrate
valentines
choose
manufacturing
canoe
ballon

electricity
fields
studies
sentences
certainly
forgotten
surface
lettuce
operetta
experience
orchestra
whether
principal
population
reindeer
stepped
garage
capital
products
gotten
colonies
germs
slippers
prettiest
rifle
pupil
material
neighbor
conquest
college
secret
mother's
terrible
pleasant

husband
common
region
assembly
giant
castle
industry
disease
modern
buried
necessary
auditorium
remembered
general
aunt's
association
climate
cousins
factories
subjects
sentence
attention
neighbors
exciting
system
you're
eighth
typewriter
practice
recess
handkerchiefs
certain
cellar
stomach

The above list from the American English Book 4, by Burrows, Stauffer and Jackson.

APPENDIX Q

200 EXTRA-HARD WORDS FOR GRADE FIVE SPELLERS

aisles
families
attended
cruel
character
pigeon
length
umbrella
gymnasium
chocolate
district
search
cafeteria
paragraph
skinned
difference
generally
excellent
tennis
throne
committee
occupied
happily
weighed
commerce
suggested
alfalfa
touched
fierce
equipment
century
merry-go-round
criminal
appeared
children's
twenty-five
succeeded
author
scratch
sister's
league
cabinet
naughty
religious
boundary
happiness
pitcher
disappointed
magazines
machinery
salmon
quantities
vegetable
spirits
lightning
intelligent
religion
cranberries
musical
territory
vice-president
deposits
roller skates
examinations
salute
magazine
angel
enemies
comfortable
drowned
further
community
developed
usual
men's
natural
continued
sandwiches
stoop
kindergarten
mirror
trimmed
principle
permission
independence
pardon
agriculture
anxious
separated
princess
stationery
accidents
practicing
Christ
examination
civil
wreck
listening
various
materials
satisfied
per cent
expense
height
cocoon
independent
military
ache
wrap
breathe
council
exercise
confederation
happiest
diamond
social
haunted
blossoms
established
process
unknown
hygiene
impossible
amusement
colony
successful
Negroes
purpose
listened
extremely
awfully
gym
pickles
temperature
odor
envelope
crowded
scenery
liquid
icy
multiply
graduated
decorations
energy
grandpa's
pigeons
Capitol
rapidly
prepared
phrase
continent
pier
blooming
invitation
method
pirates
towards
governor
they're
wealthy
immediately
medicine
transportation
example
grammar
carriage
lawyer
discovery
ancient
excitement
memory
exclaimed
disappeared
mineral
calves
rooster
occupation
spirit
nephew
meant
scissors
considered
project
adopted
groceries
surrounded
niece
smallpox
valuable
engineer
poison
grandma's
success
easier
argument
harness
calendar
girls'
escaped
dining

The above list from American English Book 5 by Burrows, Stauffer and Ferebee.

APPENDIX Q

SPELLING GAMES AND MNEMONIC DEVICES

From Resource Materials for Teachers of Spelling by Paul S. Anderson

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Games provide extra motivation for some of the drill children need to master the spelling of our language. While it is unlikely that spelling will ever have the fascination of baseball for some children, or golf for some adults, interest in words and their spelling can be heightened by using a game involving spelling. The daily crossword puzzles of the newspapers is an example.

GAMES FOR PRIMARY GRADES

1. PUZZLE ELEMENTS.

a. I am in sled, sleep, and slip. What sound am I?
b. I am in took, but I am not in look. I am________.
c. Baby, book, ball. The b is at the ____________.

2. MAKING NEW WORDS BY CHANGING THE VOWEL.

bat bet bit but cat
cot cut bug big beg
for fur far ham hum
him pen pan pin pot
pat pit

3. MAKE ALL THE WORDS YOU CAN BY ADDING LETTERS TO THESE COMMON ENDINGS. (The old word family idea.)

all -- call ball tall fall hall stall wall
and -- sand band hand land
old -- cold bold fold gold hold
an -- fan can man pan ran
in -- tin bin fin pin
ike -- bike dike like hike mike
ate -- bate crate date fate gate
ill -- bill dill fill hill pill

4. TREASURE BOX.

Words are written on separate slips of paper which are then folded and put into a box called the treasure box. Each child in turn draws out a slip which he hands to the teacher without opening it. The teacher pronounces the word and the child attempts to spell it. Any misspelled words are handed back to the children who had difficulty with them. The object is for the pupil to end the game with no slips of paper. Those who do have slips learn to spell the words that are on them. Two children can thus provide extra practice for each other as they play this game in the quiet corner.

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5. FIND IT.

Words are listed on the blackboard. The teacher or a student gives the definition of the word and the children in turn write the word defined.

6. HEAR IT.

The words are listed on the board. The leader says, "I am thinking of a word that starts with the same sound as one hears at the beginning of ______________," or "one rhymes with ______________." The children write the words indicated and gain a point for their own score for each correct selection.

7. NOVELTY SPELLING.

Instead of calling words from a spelling list, the teachers asks such questions as "Spell a word that rhymes with joint." "Write a word containing ph which sounds like f." "Write a word that means ______________." Have the class in turn read their lists. The variety adds interest as well as influencing vocabulary.

8. RING THE BELL.

This is to get practice during those moments while waiting for the bell to ring at recess or noon. The teacher pronounces words while the group waits for the bell to ring. The one spelling at the time the bell does ring is the "Bell Ringer". This is effective when misspelled words, used during the day, are listed on the board and used in the drill.

9. BLACKBOARD SPELLING.

Primary children feel it is a privilege to write on the blackboard. Reserve a place at the board where a child may go during his free time just as he might go to the library corner. Each put a different exercise on the board, such as:

What children in our room have names that start with B?
What do you want for Christmas?
What do you like to eat?
Where would you like to visit?
How many words do you know that start with wh?

10. WORD GROUPS.

Children make a collection of words about a topic or interest. One may collect "Christmas Words," another "House Words," "Sport Words," etc. These may be made into simple picture dictionaries or charts.

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11. PICTURE WORDS.

This is similar to the above except that the student starts with a picture and then lists all the words he knows that might be found in the picture or writing about it.

12. WORDS WE USE.

Have each child select two words from his social studies lesson that he thinks the class should be able to spell. Put the words on the chalkboard. Then have a class discussion on which ones seem most important and which few (no more than ten) they should concentrate on. Have each child copy the master list and study it. Devote the last few minutes of the social studies class to testing on these words. Example: street, store, milkman, post office, mail, truck, railroad.

13. BASEBALL.

Players are pitcher, catcher, and batters. Pitcher tosses a word to a batter. If he spells it correctly, he goes to first base and next batter comes up. If he misses, the catcher spells the word. If correct, the word is a caught pop fly. Batter then becomes the pitcher, pitcher the catcher, and catcher a batter.

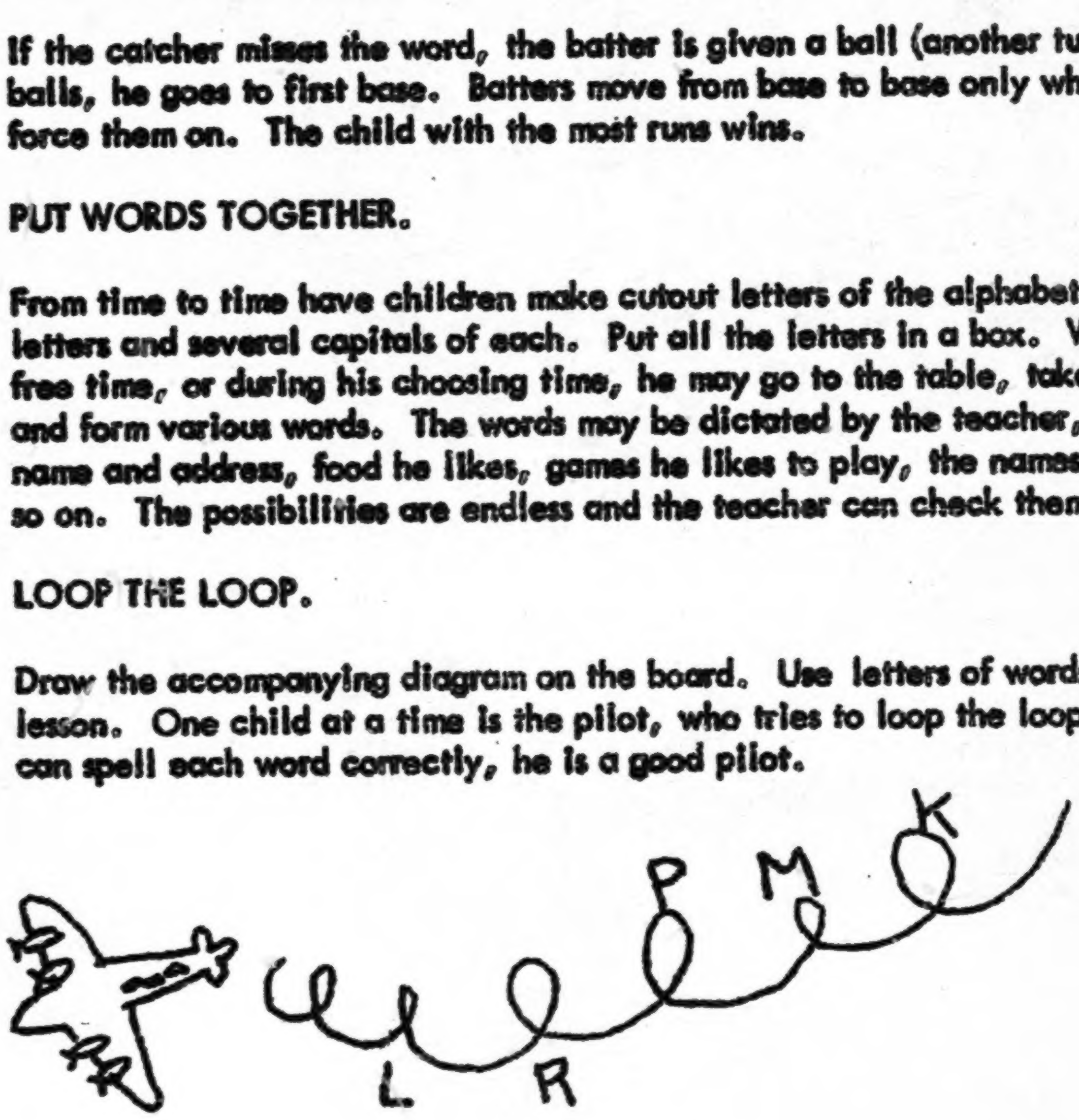
If the catcher misses the word, the batter is given a ball (another turn). With two balls, he goes to first base. Batters move from base to base only when other batters force them on. The child with the most runs wins.

14. PUT WORDS TOGETHER.

From time to time have children make cutout letters of the alphabet with several small letters and several capitals of each. Put all the letters in a box. When someone has free time, or during his choosing time, he may go to the table, take out the letters, and form various words. The words may be dictated by the teacher, they may be his name and address, food he likes, games he likes to play, the names of his friends, and so on. The possibilities are endless and the teacher can check them at a glance.

15. LOOP THE LOOP.

Draw the accompanying diagram on the board. Use letters of words from their spelling lesson. One child at a time is the pilot, who tries to loop the loop perfectly. If he can spell each word correctly, he is a good pilot.



16. MIDGET AUTO RACE.

Draw a picture representing a race track with letters and a midget racing car. Use the letters of words from their spelling lesson on the track. Each child takes turn racing around this track by correctly spelling the word that the letter starts with. Have a timekeeper and time each racer. The child who spells the words in the shortest time wins the race.

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SPELLING GAMES FOR UPPER GRADES

1. BASEBALL

A game especially good for practice on words frequently misspelled. Each card contains a word, a value such as one base hit, home run, etc., and the name of the position who is to catch the ball if it is misspelled. The cards would be like this:

all right	separate	February
2-base hit	home run	3-base hit
3rd baseman	pitcher	right field

Sometimes children take positions in the classroom as if it were a baseball diamond. It is equally interesting to use a blackboard diagram with players remaining at their seats while the team captain indicates their movements on the diagram.

2. ROOTS AND BRANCHES.

This game is intended to develop awareness of parts of words, particularly grades 2 to 6. Make four cards for each of several root words--for example, march, marched, marching, marcher; fear, feared, fearing, fearful, etc.

Make enough copies of each set of words for four "books." Shuffle the cards and deal six cards at a time to each player. Players sort their cards as in playing "Authors". If a player holds four cards of words from the same root, he can make a "book". Each player in turn may call for a card by naming the card he holds and may continue to call as long as other players hold wanted cards. When there are no more available cards of the kind he calls, he discards, and the next player takes his turn. The objective is to get as many books as possible. Care should be taken in preparing the cards for this game not to introduce different elements too fast for retarded readers; for example, doubling the final consonant of a root, or changing the sound, as lose and lost, etc.

3. SPELLING JINGLES.

When the children come across a new word, they can help establish its spelling in their minds by writing jingles using the word in rhyme. The children enjoy composing the jingles and, at the same time, learn to spell the new word and other similar words. When the word "night" was learned, for example, the following was written:

When it is night
We need a light.

4. WHAT'S MY WORD?

Each child has a different word. One stands in front of the group. Each student in

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turn may ask one question, then spell the word he thinks is the word of the one in front. The questions may concern the meaning, the beginning sound, a rhyming word, or the word root. The student who identifies the word takes the leader's position.

5. SMOKED BACON.

Make two or more sets of cardboard letters with the letters of SMOKED BACON. Teams face each other with each child holding one letter. Teacher calls out a word which can be spelled by these letters. First team to get in correct positions gets a point. These letters form, at least a hundred words.

This can be a blackboard game. Write SMOKED BACON on the board. Let each team write a word in turn. The winner is the one who writes the longest list of words in a certain time limit. As a flannel board game, this may be a group of individual activity.

A list of 87 possible words to make from the words--SMOKED BACON-- accompanied with a flannel board:

Words used by 50% or more of the 2nd and 3rd grade children:

see
an
am
as
no
do
so
does
made
bed
came
men
done
back
name
same
dad

come
some
bake
make
snake
cake
bad
mad
sad
can
man
book
cook
moon
soon
sand
band

Words used by less than 50% of the 2nd and 3rd grade children:

desk
naked
son
dam
mood
dance
den
sob
mob
nod
sock
mock
code

base
case
sake
smoke
canoe
cane
sane
soda
mean
bean
bone
cone
sack

Other Words

doe
soak
moan
sac
nab
cab
dab
snack
cob
sod
dock
moose
noose
ace
coke
dean
smack
cad
ban

6. SAVE YOUR PARTNERS.

Students are divided into groups of three. Several categories are put on the board or one may be enough. The teacher names a letter such as "b". If the category were cities, number one of the trio must think of a city beginning with "b". Then, number two must spell it in writing. Number three may save either partner. If number one cannot think of a city, number three may name one. If number two cannot spell the city names, number three has a chance to save him by spelling it correctly. Each trio competes with another. If number three cannot save either number one or two, that trio loses and may take their seats, or a score might be kept between competing groups.

7. YOU CAN'T CATCH ME.

As the teacher gives the first word, each child writes it on his paper. Then the papers are passed in a predetermined order (to left, etc.). The child receiving the paper checks the last word and writes the word correctly if necessary. Then the teacher gives the second word and the papers are passed. Every paper should be perfect if all errors are caught. While this may not always happen, those words needing review will have received attention in a different way.

8. SPELLING TIC-TAC-TOE.

Two individuals compete, each in turn. No one writes in a word on crossbars of the tit-tat-toe game. The object is to write three words in line or diagonally which contain a common element. This may be beginning, ending, prefix, word root, etc. The first player has written "bring" in a square. The second player writes "happy" in the middle square. The first player now writes "string" in a square. The second player writes "sleepy" in a square. The first one writes "spring", the second puts in "lumpy". The first player then puts in "ring" (or any "ing" word) and wins.

bring		sleepy
ring	happy	
spring	lumpy	string

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TABLE XXIV

STANDARD DEVIATIONS

HOW I LIKE SCHOOL INVENTORY

		Lincoln		Emerson		Cleveland	
GRADE		1	2	1	2	1	2
3	1	6.91	4.68	6.19	8.33	3.55	3.13
	2	6.05	6.96	5.37	5.56	3.28	3.71
	3	5.77	4.83	7.04	7.97	4.74	8.82
	Total	6.39	5.57	6.41	7.53	3.97	6.05
4	1	3.59	3.66	8.72	5.05	3.45	5.03
	2	5.02	5.67	5.00	4.30	5.02	6.22
	3	5.36	7.11	5.56	5.88	7.53	7.25
	Total	4.88	5.97	6.21	6.62	5.67	6.52
3 & 4	1	5.58	4.19	7.85	8.43	3.53	4.28
	2	5.53	6.45	5.84	5.26	4.55	5.28
	3	5.89	6.35	7.05	7.51	6.46	8.00
	Total	5.78	5.89	6.65	7.59	5.05	6.31

NATIONAL ACHIEVEMENT TESTS IN SPELLING

		Lincoln		Emerson		Cleveland	
GRADE		1	2	1	2	1	2
3	1	11.53	9.03	10.27	8.76	10.26	10.13
	2	9.02	11.69	8.24	10.70	11.93	12.04
	3	9.23	12.58	11.99	15.05	10.46	11.91
	Total	10.34	11.44	10.62	12.69	11.21	11.62
4	1	6.04	3.34	6.00	3.31	5.68	2.96
	2	9.53	8.54	7.32	4.59	8.55	4.41
	3	11.83	10.73	6.57	6.09	9.32	8.26
	Total	12.97	10.46	10.37	7.31	10.88	7.49
3 & 4	1	13.53	8.22	11.81	8.24	10.60	10.24
	2	9.54	11.14	10.42	9.23	12.53	11.38
	3	10.74	11.75	9.56	11.71	10.01	10.96
	Total	12.68	11.01	10.84	11.08	12.21	11.46

(Column 1 = Pre Test; 2 = Post Test)

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TABLE XXIV

TEST ON WORD LIST FROM PROGRAMMED SPELLING COURSE

GRADE		Lincoln		Emerson		Cleveland	
		1	2	1	2	1	2
3	1	9.12	6.48	7.38	7.94	8.68	8.30
	2	8.27	8.22	7.31	9.02	8.08	9.89
	3	8.67	8.78	8.91	12.56	8.25	8.99
	Total	8.91	8.11	6.53	10.86	8.66	9.29
4	1	4.10	2.58	4.73	1.69	4.92	1.68
	2	6.21	4.95	5.41	2.68	5.18	3.28
	3	8.49	6.69	5.81	3.07	6.54	5.28
	Total	8.60	6.97	7.74	3.72	7.44	4.97
3 & 4	1	9.51	5.34	8.81	6.52	9.18	8.00
	2	7.56	6.69	8.15	6.98	8.95	9.13
	3	8.81	8.00	7.48	9.89	8.19	8.27
	Total	9.45	7.56	8.96	8.60	9.55	8.89

TEST ON RULES OF SPELLING

GRADE		Lincoln		Emerson		Cleveland	
		1	2	1	2	1	2
3	1	8.87	6.87	7.38	7.63	9.83	9.84
	2	11.19	7.95	7.14	7.54	10.62	8.44
	3	9.69	12.56	12.70	17.04	9.39	8.64
	Total	10.40	9.90	10.08	13.49	10.72	9.66
4	1	7.59	3.97	5.46	2.50	6.13	3.88
	2	10.65	8.74	5.88	5.41	8.78	8.18
	3	10.14	8.36	8.63	5.42	8.48	9.20
	Total	11.27	9.64	9.34	6.16	10.34	9.49
3 & 4	1	9.25	5.72	9.07	6.99	9.97	9.63
	2	10.93	9.38	7.68	6.97	10.80	9.61
	3	9.93	11.27	10.99	13.99	9.30	9.59
	Total	11.02	9.96	10.64	11.12	11.47	10.77

(Column 1 = Pre Test; 2 = Post Test)

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TABLE XXIV

TEST ON WORD LIST TO MEASURE TRANSFER OF SPELLING SKILLS

GRADE		Lincoln		Emerson		Cleveland	
		1	2	1	2	1	2
3	1	9.74	8.52	6.44	7.50	8.32	8.25
	2	7.74	6.89	5.58	8.45	8.77	10.82
	3	12.18	9.19	9.39	11.99	7.93	9.68
	Total	8.81	8.69	7.60	10.13	8.69	9.83
4	1	5.00	1.98			5.37	3.19
	2	5.72	6.34			6.93	3.22
	3	7.41	9.19			6.16	5.20
	Total	7.18	7.94			8.12	5.04
3 & 4	1	10.98	7.19			8.60	7.83
	2	6.85	6.65			10.10	9.73
	3	7.86	9.25			7.37	8.34
	Total	9.52	8.40			9.57	9.00

(Column 1 = Pre Test; 2 = Post Test)

APPENDIX S

TABLE XXV

MEAN SCORES ON THE LORGE-THORNDIKE INTELLIGENCE TEST BY SCHOOL, GRADE, AND ABILITY GROUP

GRADE		N	Lincoln	N	Emerson	N	Cleveland	N	TOTAL
3	1	18	126.00	16	127.31	19	125.16	53	126.09
	2	17	116.41	15	116.73	19	113.84	51	115.55
	3	18	101.33	15	104.80	19	102.95	52	102.92
	Total	53	114.55	46	116.52	57	113.98	156	114.92
4	1	18	120.06	19	126.11	22	120.95	59	122.34
	2	18	109.00	19	113.42	22	110.91	59	111.14
	3	17	95.00	20	101.00	22	101.50	59	99.37
	Total	53	108.26	58	113.29	66	111.12	177	110.98
3 & 4	1	36	123.03	35	126.66	41	122.90	112	124.17
	2	35	112.60	34	114.88	41	112.27	110	113.18
	3	35	98.26	35	102.63	41	102.17	111	101.08
	Total	106	111.41	104	114.72	123	111.54	333	112.83